The Builder.

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A Proper Welcome to Mr. Whitworth's Donation.

THE patriotic munificence of a man of whom all those in any way interested in the arts of construction may well be proud, whether they regard him as a mechanician or as an artillerist, has a special claim to commendation in our columns. It will be in the recollection of our readers that we have on more than one occasion brought before their notice some of the most important features of Mr. Whitworth's projectile system. To give an absolute and authoritative decision on a matter of military engineering is somewhat beyond the scope of the *Builder*. The great beauty and utility of some of Sir W. Armstrong's inventions we very heartily recognise. Yet we lean to the opinion that Mr. Whitworth has been rather hardly dealt by as regards the recognition of his claims as an artillerist. Foreign Governments would seem to have been more prompt to recognise them than has our own. In reading the evidence printed in the several Blue Books, moreover, there sometimes appears to have been scant courtesy shown to the distinguished mechanic. He was at times sharply cross-questioned by men whose interest in rival schemes should have prevented them from coming into collision with him except in the character of avowed rivals or retained advocates. Nor does Mr. Whitworth seem to possess that rare, that almost unique, genius, which is equally at home in doing and in talking, in designing and in describing, in free command of the hand and of the tongue.

It is in accordance with the usual principles of human action that Mr. Whitworth may have himself felt the force of some such reflections as our own. The man who, having laboured long at a difficult subject, has acquired a large amount of positive knowledge, is apt to feel a natural impatience at the criticisms of those who have not yet mastered, and do not seem to care to master, even the A, B, C, of his science. If called upon to explain and to dilate he is apt to refer you to the "two-foot rule." A true mechanic is always happy when explaining his inventions to a pupil or an attentive listener. He is apt to shut up closely if attacked by a critic, or pumped by a rival. While then in the European celebrity, and in the substantial wealth, which he has attained, Mr. Whitworth is one of the last people who should be called a disappointed man, it is more than probable that he has read the text that a prophet is not without honour save in his own country with a certain soreness of self-application.

If so, he has taken one of the noblest revenges recorded in history. With the sole exception of what the munificence of commerce has done for the intended relief of poverty, in the instance of Mr. Peabody, the Whitworth donation of 3,000*l.* a year for ever to the nation is unrivalled as an act of noble patriotism. It is liable to no distortion by criticism. It is not a legacy, which often means a gift at the expense of others, perhaps at the expense of the rightful owners, of that for which we have no further use. It is not the lightly-handed-over gift of lightly-won money; the godsend of an unexpected bequest; the lucky result of a risky bet; nor even the fruit of a commercial venture. It is not the consecration to self-glorification of a sum earned by trade, strictly so called—that is, the mere profit between wholesale and retail price,—which knows no limit but that of the amount of custom. It is the fair, hard, honourable earnings, won by the head that can plan, the hand that can execute, and the will that can persevere unto success, that Mr. Whitworth has laid upon the altar of his country.

The gift is no less wise and appropriate than noble. It is, above all things, timely; and it indicates a new issue from a perplexed and most important controversy. In the absence of the information which the result of the *Real-schulen* of Germany, and of the non-classical and secondary instruction now organizing in Italy and in France, may supply in a few years for our guidance, the most ardent admirer of the time-honoured method of classical education must regard with approval the foundation of mechanical scholarships. The details will be matter for future discussion, but an endowment of this kind is enough to form the nucleus of an Industrial University. For boys who in early youth show mechanical talent, no definite, well-adapted means of tuition are now open. The course of education given to the articled pupil of an architect or of a civil engineer depends on the talent, the occupation, and the conscience of the master. If all these be of the best, and if, into the bargain, the pupil be industrious, there is not only a good preparation for, but generally a fair introduction to, his future life. Still the risk is often great; the premium is usually heavy. We knew an instance recently of the acceptance of several pupils, and their premiums, by a professional man who had plenty of business going on in his office. It all, however, related to a single large public work, which came to a natural conclusion—an honourable conclusion, for the undertaking was completed, and, though not beyond the reach of criticism, was a success. But with this event came also the conclusion of the labours of office. The master had nothing more to do. There was nothing for the pupils to do either. Education and professional introduction vanished in smoke, and if the lads wanted practice they had to find it for themselves.

In the case of mechanical engineers some also take pupils. The same remarks apply in this as in the other instance. A practical knowledge of the interior of a workshop is in itself an advantage, but that scientific training which is needful to raise a man from the rank of a mechanic to that of an engineer is more rarely to be met with in the manufacturing than in the civil branch. For military engineers we have an admirable education in the Royal Military Academy, but we have no special secondary education to fit young men for the examination at Chelsea Hospital. A general education, however excellent, would enable but few to pass this severe ordeal, and the services of special tutors, men who prepare merely for passing the examination, are in most cases requisite to success. Apart from these unsystematic means of professional tuition one or two chairs have been erected in connexion with the London and the Scotch Universities. That the whole educational power now in existence might be organized and combined, and secondary schools for the preparation of students of engineering, of architecture, and of mechanics, might be invested with the sanction of professional recognition, and of examinations that resembled rather those of the Prussian system than those of our own inadequate competitive method, and that a faculty should be organized for the superior education of those pupils who are intended for the higher stations of the profession, is a hope to which the donation of Mr. Whitworth seems to give a practical prospect of fulfilment.

Disinterested as this noble benefaction is, it cannot fail of ensuring a more ample recompense to its author than could have been bargained for by any political combination or obscure intrigue. First element of this imperishable recompense must be the satisfaction of the conscience, and the reflection, which we trust will for many years be present to the benefactor, of what his own labour has enabled him to do for his country. Next will be the undying memorial to his name which generation after generation will welcome in the persons of those Telfords, and Stephensons, and Watts, and Whitworths of the future, who shall have been trained at the cost of the donation. We cannot for a moment doubt that the thoughtful and gracious Lady who has omitted, even in her deepest affliction, no proper occasion of proving that a constitutional sovereign is not a mere blank form, has already considered when and how the highest expression of the gratitude of the nation can be most fitly awarded to the founder of a systematic technical education for England. While ever leaving political action to the charge of those who are responsible to Parliament for the conduct of the affairs of the State, the Queen has shown that she is herself the true minister of that function of the Crown which is regarded when we speak of the Sovereign as the fountain of honour. The miners and mechanics of England can never forget that on every occasion when the perils which they so constantly dare have overborne their vigilance, and overwhelmed their efforts, the first services of the telegraph, to condole with and to inquire after the sufferers and those bereaved by their loss, have been employed by the first Lady in the land; the readiest contribution in alleviation of sudden distress has come from the privy purse of her Majesty. Where institutions different from our own have disabled the citizens of another country from accepting any of those marks of recognition of which Englishmen are justly proud, the Queen has known how to originate special and peculiar badges of honour proper to the occasion, as in the gift of her Majesty's portrait to Mr. Peabody. We have no wish to anticipate any condescending proof of the Royal recognition of what Mr. Whitworth has so opportunely done to forward the solution of the great English difficulty of the day; but we are sure that, whether the public ever learn it or not, all that good feeling, good taste, and good sense would consider most appropriate will freely flow from the *motu proprio* of Queen Victoria.

There is yet another response which we sincerely trust it will need little more than so humble a voice as our own to elicit. For the sake, not of himself but of ourselves, Mr. Whitworth's gift must not fall flat, and without an echo from the great centres of commercial and manufacturing industry. Hardly one great employer of labour can have read the few words that announced the donation to the House of Peers and to the House of Commons, without feeling a tingle in his veins. Hardly a corporate meeting can have been held at Manchester, Liverpool, Leeds, Birmingham, or any of the local capitals of industry, without reference to, or at least without thought of, the example

given of the best method of employing the fruit of successful enterprise. It is our custom to greet less important exertions on behalf of our country with municipal marks of honour, which are gratifying to their recipient, but barren in themselves. Freedom of towns and cities, enclosed in gold-plate boxes, are the usual signs of corporate gratitude.

We trust that the thanks of the industrial leaders of English enterprise will, in this instance, take a more practical form. In whatever manner the Whitworth donation be carried out,—whether it form the nucleus of a technical university, whether it lead in the first instance to the preliminary step of the creation of a *Faculty of Constructive Science*, or whether only the organization of the thirty scholarships occupy the sole immediate attention of the trustees of the fund,—it is highly desirable that there should be a *Seat* and a *Home* for the administration. To provide this is a necessary complement to the donation itself. A noble and worthy building should at once be constructed for the purpose, and a very moderate contribution from each of the great towns, the prosperity of which depends so intimately on the maintenance and advance of constructive science among us, would suffice for the establishment of such a collegiate edifice. The Whitworth College should be the echo given by the industry of the nation to the Whitworth donation.

The site of such a building should be in a position central, as far as possible, amid the industrial districts of England, and yet removed from the actual unhealthy vicinity of any great mass of human habitations. Some spot like Crewe or Normanton, some great railway centre of communication which is not itself a city, would seem to be the best locality. Thus, too, any local rivalry would be avoided. The great Lancashire towns might hesitate to aid in founding the college at Birmingham, in itself a very natural site. Staffordshire and Monmouthshire might feel less anxiety to support a Liverpool or a Manchester college than one chosen so as to be as far as possible central to manufacturing England. The determination of the site is, of course, only a detail; but the determination of the principle on which the site should be selected is a matter essential to the fair starting of the subscription.

We suggest, therefore, to the lord mayors and corporations of London and York, to the mayors and other municipal authorities of all great cities and towns dependent on mechanical and manufacturing industry for their welfare, and to all those great employers of labour who desire to see the industry of Great Britain resume that pre-eminence which is now slipping from our grasp, that a subscription should be at once opened for the purpose of acknowledging Mr. Whitworth's gift to the country by providing his foundation with a Home. A very modest echo to a very loud call for gratitude will do this. How far the heart of the country is stirred by so noble an example, will soon become apparent. It is our hope and belief that all which is requisite is that a prompt example should be set by some leading city in the matter. Considering that vast amount of private beneficence which, while perhaps often misdirected in its course, enriches England with voluntary good will, we cannot doubt that it is only necessary to make a proper appeal to the country to receive a proper response. It would cost England little to double or to triple the donation. Great as that gift is, it ought to be most precious as a nest egg. Around the thirty scholarships will group—if we are not anxious to show that Mr. Whitworth is Quixotically in advance of the public spirit of his countrymen—college, and chairs, and lectureships, and full machinery for affording to the youth of the country a sound technical education which shall not be inferior to that now obtainable in the first institutions of the Continent. A centre of aggregation is now provided. It is, to a certain extent, independent of further contributions. But, to make the most practical use of that central benefit, we must hasten to surround it with subsidiary advantages. Primary schools, in connexion with each great industrial establishment, should receive an impulse from the constructive centre. Secondary schools, in each great seat of industry, should be in direct communication with the college. Education in the higher parts of constructive science should then be provided for those who are able and willing to pay for it, as well as for those who, by a fair and wise selection, not by the mere chance of a single examination, prove their claim to the enjoyment of the thirty exhibitions. A few months' activity might make the present donation the prolific source of that which the reports of the Royal Commissioners admit to be so great a desideratum for England, a sound technical education, one in which practice and science may combine to do for the English engineer all that human skill and human wisdom can do to perfect his accomplishment.

For any communications on this subject the columns of the *Builder* will be open. While we wish the movement to be locally spontaneous, we shall be glad to afford the means of ready and public correspondence between the different movers in the matter. We shall be happy to give any aid to the formation of a central committee, each subscribing town to nominate a member, or to charge a member already nominated with the representation of its own voice. The occasion is most apt. The attention of the public is called in the very nick of time. Great questions, after the solution of which some are groping in the dark, some are seeking for information from other countries, and as to which some are preparing for a stern and dogged fight, will receive unexpected and most welcome solution from an organised, centralised, voluntary effort to supply at once and adequately one of our most miserable deficiencies. We call upon all who rank in the yard of the builder, upon all who live by the trowel and the pick, the hammer, the adze, and the chisel, the drawing-board and the pen, the foundry, the forge, and the loom, to echo our proposal, that the gratitude of industrial England for the Whitworth donation be shown by providing a Home for its reception.

ON THE UTILIZATION OF SEWAGE BY IRRIGATION.*

In the cases of large towns upon small rivers, and those rivers impeded by numberless bars or weirs,—both of which conditions are exemplified by the river Medlock at Manchester, and the Sheepscar Beck at Leeds,—the injury is not the effect of sewage hourly delivered as it is produced, but that of a putrid mass of organic matter, which, floating for days upon the surface, develops into a filthy scum, revolting to the senses. At Carlisle, where there are no weirs to retard the rapid flow of the sewage after mingling with the volume of the Eden, a complete system of main drainage conveys every particle of the sewage from beneath the city within a few hours of its production; so that, not having time for putrefaction, the river is less than usually contaminated, and salmon and trout abound in it.†

At Norwood, where the irrigation works are in the immediate vicinity of the town, this fact is so far from proving the source of a larger death-rate than the average in that district, that a comparison of the bills of mortality for the six years between 1860 and 1865 shows that during the period of irrigation the mortality was the lowest—a conclusive answer to those who insist upon its deteriorating effects on the atmosphere.‡ Mr. Albert Latham has also recently stated that while the mortality of the town districts for the year 1867 was 2·38 per cent., the country districts being 1·95, the mortality of the town of Norwood was only 1·47 per cent. At Edinburgh, where sewage has been utilized for centuries, no injury to health has arisen from the proximity of the irrigation works, although the applications have been in enormous quantities.§

Though opposition has tended to retard the progress of irrigation in its first stages, and thus, in the opinion of many, injured the cause of sanitary reform, yet it is impossible to doubt that it has done negative good. The tendency of speculation is to lay hold of and carry to a disastrous degree discoveries which are of fair promise, without consideration as to their limit of practicable application, or indeed as to their full development for commercial purposes. Consequently, that which raises up doubt and caution in the mind, and conducts us by a searching process of argument, analysis, and experiment, to a comprehensive knowledge of every side of a question, must not be viewed as altogether valueless, since it is by this means alone that we can hope to acquire perfection without the costly teachings of experience. The attempts, therefore, to prove the unwholesomeness of sewage irrigation have had the result of producing in evidence a record of facts showing the groundless nature of such a fear, and establishing on sanitary principles the expediency of its adoption.

Quantity of Sewage to be put into the Land.

The expediency of sewage irrigation having been shown, we have endeavoured to explain some of its advantages, and also to answer the chief objections which its opponents have urged against it. To complete the present analysis of the subject, it now remains to inquire in what quantity it is necessary to bestow sewage upon the land, in order to ensure the greatest possible benefit. Notwithstanding all that has been hitherto accomplished in this country, it can scarcely be said that the experience so gained has been sufficiently extensive to justify our forming exact conclusions upon this important point; and, indeed, it is highly probable that in the end it will be found that no two soils are alike in their capacity for profitably absorbing sewage. At present nothing can be more diverse than the opinions of the various authorities upon this subject. Some of these incline to light and infrequent dressings—amount to from 100 tons to 500 tons per acre per annum; others substitute thousands for hundreds, and go as far as 9,000 tons; while there is a small minority who consider that there is actually no limit to the quantity to which sewage may be beneficially supplied. These latter, however, ignoring the fixed laws of economy, qualify their statement with the proviso that the sewage is to be had for nothing, not seeing that what is waste in a price-bearing commodity must be equally waste in a commodity which is of free cost, but of which the supply is limited.

The following is evidence given before the Select Committee in 1864 in this regard:—

Mr. J. J. Moore did not think it would require more than 5,000 tons per year to the acre.*

Mr. R. Smith considers that 800 tons would be more than sufficient, but that grass lands would absorb more.†

Mr. Ellis says that it is a mistake to suppose that the returns are in proportion to the sewage applied; and, in making his calculations for the area over which he proposed to distribute the sewage of the metropolis, he allowed 500 tons per annum to the acre; this to be applied in several dressings, amounting in the aggregate to a depth of 4·9 inches.‡

Mr. Cuthbert Johnson stated that at Croydon, of whose local Board he was chairman, 1,000,000 gallons per day were being put on 250 acres, which gives 6,500 tons per acre per annum.§

Mr. Whitehead considers the sewage of seven to ten persons sufficient for an acre; while Alderman Mechi would apply four or five dressings of 100 tons each to grass lands.‖

Mr. Walker, of Rugby, recommends from 500 to 1,000 tons per annum to the acre, in five or six dressings.¶

Mr. Lawes, employed by Government to investigate the value of sewage applied to land, found by experiment that with 3,000 tons per acre, 22 tons of grass, producing 5 tons 1 cwt. of hay, were obtained; with 6,000 tons, 30 tons of grass and 5 tons 15 cwt. of hay; and with 9,000 tons, 32 tons of grass and 6 tons 9 cwt. of hay per acre; whilst without sewage 9½ tons of grass and 3 tons of hay were the result. He considers 6,000 tons to be the most profitable quantity; but if the sewage cost nothing, would put on 30,000 or 40,000 tons.**

Professor Way recommends 3,000 to 6,000 tons per acre.††

The amount consumed on the Craigentinney meadows was stated to 6,400 tons per acre.‡‡

At Barking the quantity varies between 2,400 and 4,000 tons per acre.§§

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* See pp. 146, 168, 202, 222, and 239, *ante*.

† Rep. Met. Sewage, 1864, 4,098. Experimental works on a large scale now (1867) being carried on at Carlisle, with a view to the utilization of the sewage.

‡ Mr. Latham's paper, read before Soc. Eng., April, 1868.

§ Leam. Congress Papers, p. 177. The Rivers Pollution Commissioners' report contains this statement:—"In the neighbourhood of Edinburgh, 70,000 and even 120,000 tons of sewage are said to have been floated over each Scotch acre (6,000 yards) of the sea-sand without creating a swamp."—Vol. i. p. 16.

* Rep. Met. Sewage, 1864: 1134.

† Rep. Met. Sewage, 1864: 1572.

‡ Rep. Met. Sewage, 1864: 1790.

§ Rep. Met. Sewage, 1864: 2281.

‖ Rep. Met. Sewage, 1864: 2882, 3848.

¶ Rep. Met. Sewage, 1864: 3624.

** Report. Met. Sewage, 1864: 4351, 4567. Mr. Lawes also stated that he had experimented with no less a quantity than 3,000 tons per acre.

†† Rep. Met. Sewage, 1864: 4949-50.

‡‡ Rep. Met. Sewage, 1864: 4073.

§§ *Agricultural Gazette*, July, 1867.

The Earl of Essex applies the sewage of Watford to hay meadows at the rate of 225 tons per acre, in two dressings, and to Italian rye-grass 270 acres after each cutting.*

In the report of the Rivers Pollution Commission we find it stated that on poor land 5,000 to 20,000 tons of sewage per acre per annum may be filtered; whereas on good land, where paying crops and perfect purification are looked for, 6,000 tons are as many as can be profitably applied.†

Baron Liebig says that to produce four tons of hay on a pure sandy soil, 2,430 tons of sewage are required; but that the necessary quantity is ruled entirely by the nature and condition of the soil. If the soil contains more of the constituents of the plant, less sewage will be needed; if it contains less, then more sewage will be needed. Thus, on a soil which will supply one-half the necessary food in the growth of hay, not more than 1,215 tons need be applied to produce the four tons of hay.

But inasmuch as it is not the object of agriculturalists to exhaust the fertilizing properties of the soil, and throw the whole burthen of reproduction upon the action of sewage, this manner of calculation is subject to modification. If, therefore, four tons of hay represent twenty tons of sewage-grown grass, and it be considered that, according to Mr. Lawes's experiments, more than twenty-two tons cannot be obtained without a disproportionate sacrifice of the fertilising medium, it would appear that 2,430 tons of sewage are as many as can economically be supplied. In bringing, however, Mr. Lawes's experiments to bear upon this point, it must not be forgotten that many doubts have arisen as to their integrity, and that by many authorities of weight they have been condemned as utterly worthless. The very fact that he never experimented with a smaller quantity than 3,000 tons, which we have from his own lips, would of itself appear to justify these doubts. Mr. Walker, upon whose land the experiments were conducted, states point-blank that they are calculated to mislead the public as to the true value of sewage manure, in so far that the applications of sewage were made at certain fixed intervals, which were rigidly adhered to, without consideration as to the condition of the soil, and its adaptation for the favourable reception of the liquid.‡ The position also of Mr. Lawes as a manufacturer of a rival manure, in which it was stated before the committee that he was interested to the amount of 40,000*l.* or 50,000*l.* annually, together with his reckless assertion of the enormous quantities, 40,000 tons,§ with which he would deluge the land, are further evidence upon which to found grave doubts as to the worth of these experiments. The weight of 40,000 tons per acre represents an annual depth of no less than 33 ft.;‖ and yet we are told that even this quantity may be exceeded. Such is the authority into whose hands the charge of these important experiments has been entrusted by a confiding Government.

We have not, in fact, sufficiently decisive evidence as yet to determine this question with precision. Its importance is rendered greater by the influence it will have upon the mode of administration. If the scanty dressings upheld on the one side be finally determined upon, there can be little doubt that the hose and jet system will be found more advantageous in many cases than the special preparation required by the open carrier system, especially for grain crops. There is also another point to be considered. If—as doubtless has hitherto been the case—sewage is a drug in the agricultural market, of which its holders desire to rid themselves as speedily as possible, or if it can be bestowed but on a limited area, then the use of enormous quantities may be the better policy, taking care that too much is not passed through the soil to ensure proper purification. But if, on the other hand, as sooner or later will be the case, the demand for this commodity comes to exceed the supply, then excessive applications signify a waste of national resources.

In default, therefore, of convincing practical demonstration, we are as yet in the dark as to when the limit of the economic use of sewage on various soils is reached. When corporations take the land into their own hands for purposes of irrigation, a small area doubtless admits of easier management than a large one; and in the discussion of the sewage question this will form an item of consideration, as such bodies are justly cautious in meddling with undertakings in which the ownership or leaseship of land is involved, although by existing Acts, local Boards are empowered to assume these relations. The existence of so much doubt and uncertainty as to the proportionate application of sewage may, perhaps, be a difficulty in the way of adopting irrigation, because, it may be argued, the extent of the proposed area of utilization is dependent thereupon; and whereas, on the one hand, too extended an area would leave the controlling Board in a position nowise different from that of ordinary farmers,—on the other hand, a too limited area would defeat its own purpose. This timid policy should not prevail. In projecting works of this kind, a Board should act with caution and judgment, confining their first tentative operations to a safe area—taking care, however, that the site is so selected as to afford ample provision for future extensions. A trader who, having a perishable commodity on his hands, allows his doubt as to its exact value, or its best possible market, to prevent his turning it to account, would be justly ridiculed; yet his position may be held analogous to that of a corporate body whose impulses towards the utilization of sewage are checked by uncertainty as to the exact distributing area.

Actual Results of Sewage Irrigation.

The following is a list of the chief of those towns which, in a greater or less degree, have dealt experimentally with sewage for irrigation purposes. Aldershott, Alnwick, Bingley, Birmingham, Bury St. Edmund's, Carlisle, Cheltenham, Coventry, Croydon, Edinburgh, Leeds, Mansfield, Melton Mowbray, Milverton, Mold, Norwood, Nottingham, Oswestry, Rugby, St. Thomas Exeter; Swaffham, Tavistock, Uckfield, Warwick, Watford, Worthing; and, as has already been said, the sewage of the northern portion of the metropolis is being at present experimented upon at Barking. For the present purpose, it will be sufficient to select from these, Aldershott, Croydon, Norwood, Edinburgh, and Rugby, as practical and successful illustrations of the principles of sewage irrigation, wherein the most approved forms of application may be said to be fairly exemplified.

Aldershott.—After, as has been stated heretofore, the Government filtration works erected at these camps were condemned by an injunction from the Vice-Chancellor, the sewage of Aldershott, comprising a population of from 12,000 to 15,000 people, was leased to Mr. Blackburn, of Aberdeenshire, for the purpose of being utilized on the waste land of the adjoining Aldershott Heath,—a barren common consisting of loose white sand, drifted here and there into irregular heaps, and covered with heather. This experiment has now (1867) been in hand for two years, and gives every appearance of ultimate success. At the southern outfall, a 12-horse engine has been laid down, which drives a centrifugal pump for the purpose of lifting the sewage on to the higher portions of land not accessible by gravitation, upon which it is distributed by means of the hose and jet system. At the northern outfall, the sewage discharged by which flows on to the land by gravitation upon the open conduit system, a very simple and well-devised arrangement exists, by which the grosser obstructions contained in the liquid are retained. This consists of a small wooden tank, provided with a strong close grating at the lower end, slightly inclined from the horizontal, through which the sewage is passed into the main conduit. This grating is in the form of a lid, and is moveable upon hinges; any overflow being prevented by a bar placed transversely across the tank, dipping below the level of the grate. About forty acres of land have been reclaimed,* and during the year 1866 six crops of Italian rye-grass were cut, averaging from ten to twelve tons per acre, and of excellent quality. When complete, the irrigated area is intended to comprise a farm of 140 or 150 acres in extent, reclaimed from the barren wilderness of Aldershott Heath. The scheme is exceedingly simple and effective, and is capable of economical management.

Croydon.—This town, perhaps the most complete modern exponent of the principles of sewage irrigation, certainly occupies a distinguished position in all matters pertaining to town-drainage. Forced by unavoidable necessity to have recourse to this method of dealing with the sewage of a large town upon a small river, it has been truly described as the theatre of conflict, in which the most eminent improvements in modern town drainage have been fiercely and repeatedly discussed. Injunction after injunction was discharged against the local board by the proprietary of the river; and that body, driven to extremity by lawsuits on every hand, cast about for and grasped at every conceivable expedient for extricating themselves; and at last, having exhausted them all at an enormous expense, besides creating a debt of 10,000*l.* for law costs, irrigation was tried, and ultimately proved perfectly successful. This success was not, however, of immediate growth. Croydon being, after Edinburgh—whose experience was then viewed as something not in the nature of ordinary things,—the pioneer in this movement, the Board were compelled, from lack of precedent, to grope their way. In 1857, the quantity of land upon which the sewage of 20,000 people was disposed was but 15 acres, and, in consequence, this area became covered with muddy slime, which tarned putrid and stank foully. In 1860 the area was enlarged, and the sewage was applied to 56 acres, which also, in its turn, proved by infallible signs inadequate. In 1862, the Vice-chancellor, Sir William Page Wood, granted an injunction to Mr. Bidder, the engineer, who is interested in the conservancy of the river, restraining the flow of the water after irrigation thereinto, on the ground that, it having been proved decisively that sewage could be rendered pure by irrigation, the impure results of the Croydon process must be owing to some defect in application. It was then put on an area of 250 acres, after which the water went off in a pure state, and an end was put to all litigation.* Since that time sundry additions have been periodically made to this quantity, so that the total extent now† exceeds 340 acres.

The cultivation of this area has been attended by complete success, the pecuniary fruits of which, however, had not been reaped by the ratepayers, but by the tenants,—Mr. Marriage, lessee of the Beddington Farm, and Mr. Cousins, lessee of the Norwood Farm,—who take the land under them. The Board, acting under an injunction, were forced to lay hold of the first land which presented itself, at the exorbitant price which is always exacted by necessity, and also to obtain a tenant, upon very dis-advantageous terms, to whom they allowed 3*l.* or 4*l.* per acre towards preparing the land, upon which, although otherwise excellently adapted for irrigation purposes, many woods and shaws had to be grubbed up. The rental paid by the Board for a lease of the land was 4*l.* per acre; that paid by their tenant, 5*l.*; whilst, as was stated by Mr. Cuthbert Johnson before the Commission, four crops per annum were being taken off the land, each sold at 8*l.* per acre uncut; from which it would seem that the farmer, with no outlay save his rent and the wages of two or three attendant labourers, is in receipt of 32*l.* per acre.‡ It has also already been stated, on the authority of Mr. Baldwin Latham, that the actual profit realised from the sewage of Croydon is 6*s.* per head of the population contributing to the sewers.§ Despite these facts, however, we see that the Board are only profiting by their dearly-bought experiment to the extent of 300*l.* or 400*l.* per annum, an insignificant result due to the enforced nature of the enterprise. Yet, when we consider that at one time Croydon was expending at the rate of nearly 3,000*l.* per annum in attempts at filtration and deodorization, it cannot be viewed otherwise than one of the most successful of modern enterprises. So satisfied are the authorities, that they have recently (1867) expressed their determination to pump their sewage to an altitude of 200 ft., if necessary, for utilization. Had the policy of the Croydon Board been the result of their own deliberate conviction, unquickened by the formidable penalties of the law, a revenue of possibly not less than 8,000*l.* or 10,000*l.* would at this moment have been relieving their district of a material portion of its rates. Even under the circumstances in which they acted, the experimental conduct of the works might have been better placed in the hands of a hind or manager until a proper assessment of the value of the sewage could have been arrived at.

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* Rep. Met. Sewage, 1864. App. p. 345.
† Third Rep. (Aire & Calder, 1867), vol. i. p. 15.
‡ Rep. Met. Sewage, 1864: 3628.
§ Rep. Met. Sewage, 1864: 4678.
‖ Nearly twelve times the average rainfall throughout England.

* 1867.

* Rep. Met. Sewage, 1864. Evidence of the Chairman of the Croydon Local Board, 2225 to 2235.
† 1867.
‡ Rep. Met. Sewage, 1864: Mr. C. W. Johnson's evidence.
§ The population of Croydon was 42,000 in 1866, but of these about 5,000 contributed to the metropolitan sewers.

The whole of the irrigation at Croydon being conducted on the principle of gravitation only, the works at the outfall are of no great extent. One feature, which might perhaps be remedied, is the large area of the settling tanks, which admits of the stagnation of the lighter solids floating upon the surface of the liquid. This in dry weather, is apt to cause a stench, which might easily be avoided by providing a much smaller receptacle, in which the impulse of the outfall discharge would prevent putrefaction. The refuse which is retained in this tank is sold to agriculturists in the neighbourhood, by which the expenses of overlooking the outfall works are nearly paid.* M. P.

DOMESTIC ARCHITECTURE OF MEXICO.†

IN treating of the domestic architecture of a country, and the selection of places for laying out cities and towns, there are many important matters to be taken into consideration, as to their geographical position, and the nature of the site, the geological substrata on which they stand, and their general aspect as to admitting light and air, particularly in a tropical country, and other important matters bearing on their physical and sanitary condition.

The records of ancient history attest that many of the cities of Mexico were laid out by its ancient conquerors, the Toultecs and Aztecs, wandering, nomadic, barbaric tribes, whose sole end and aim appeared to be to overrun and subdue the primitive inhabitants, and to subsist by partially cultivating the land, hunting, and fishing where water existed; and although they have left some very extraordinary monuments of their industrious habits, and constructive skill in the early ages of the world, still an attentive observer will discover, from the mode adopted, and the manner the Mexican cities are laid out, that they bear upon them the impress of well-studied design, skill, and science, the fruits of an advanced civilization, the workings of master-minds; and therefore their present state could not be the productions of those wild barbaric tribes, but of the subsequent conquerors of that country, the Spaniards, at a period when they had attained considerable eminence and skill in the constructive arts and sciences, and had established a system of architecture, possessing many points of beauty and attraction, in its decorated arcades, horse-shoe arches, and fretted vaults.

Like the ancient Romans, the Spaniards evidently devoted considerable attention to the selection of a site for their cities: the geographical position, as well as their general aspect, were carefully studied, and its applicability for sanitary purposes, such as an effectual system of surface drainage and good water supply.

In giving a description of a large and ancient city, in which we resided some time, we shall be rendering a general and faithful representation of the great majority of the large and populous cities of that country, as the constructors appear to have been governed by one general design and plan, and which was adhered to as closely as local circumstances would permit.

The general direction of the streets was evidently regulated by magnetic bearings, running principally north and south, and crossed at right angles by others running east and west; and this mode of construction was rendered necessary so as to enable the prevailing cool and refreshing trade winds which blew from the east to circulate through the streets and also through the houses, thus promoting the health and comfort of the inhabitants.

The whole streets were laid out 40 ft. wide, the centre part allotted to the carriage-way, and footpaths on each side; and the physical position was such that slightly inclined ground, or easy gradients, were secured for the contour of the streets. Their cities are laid out in a series of blocks or plots of land, about 280 ft. long and 225 ft. wide; and in the particular instance of the city alluded to there were twenty such blocks from east to west, each divided by a street, and ten from north to south, also intersected with streets; and nearly in the centre of the city some blocks were omitted in order to afford space for the "Plaza des Armis," where all the military displays and public games and entertainments take place, and some extensive blocks of this city were laid out but were not built upon.

These plots are generally divided into four building lots, each 140 ft. by 112½ ft., and upon that site are erected four substantial houses, in the peculiar system and plan of the architecture of the country; and each house, therefore, faces a street, and they are built back to back.

Around the outer area of each lot, the buildings are erected with thick substantial walls of small rubble masonry, and roofed in and covered with bright red horse-shoe tiles, and with broad overhanging eaves, some 5 ft. wide or more, on the outer side, completely covering the side path of the street; and with broad overhanging eaves on the inner side, usually supported on pillars, and forming a covered passage or corridor around the inner part.

On each side the Plaza are erected the principal public and other buildings; on one side the cathedral, a large and imposing structure, a rough adaptation of the Moresque or Saracenic architecture,—the interior elaborately decorated and highly embellished in all the gorgeous splendour of Roman Catholic countries, and surmounted with a large dome, covered with bright porcelain of many colours and patterns; and its open space in front fenced off with ornamental railing, and the ground laid out and tastefully planted with the brilliant and ever-blooming flowers of this warm and glowing clime. On the opposite side of the cathedral in the plaza is the prefecture, a one-floor arcaded building; and conveniently situated at the back of that building is the gaol. At the former, the prefect and alcalde preside daily,—the former of these functionaries to carry out the local government of the state over which he presides, and the latter to administer the laws; and that is usually conducted in such an arbitrary and cruel manner, so peculiar to the race of people whence many of them have sprung, as to savour very strongly of the dread and horrid inquisition.

The prisoners, who are generally employed on the public works, are bound and shackled with heavy chains, and in this barbarous manner are they compelled to labour, watched by the eagle eyes of the warder, armed with the stern authority of the rifle.

On the side of the Plaza are the hospital, the post-office, quarters for the officers of the garrison, and some of the principal stores or "tiendas;" in fact, the Plaza is a place of the first importance, the centre of great attraction to the inhabitants as well as the traveller, and the general rendezvous, on all occasions, of public entertainments, military spectacles, and national *fêtes*.

The Plaza is not only used for the purposes just mentioned, but also is a public market-place, and the market is generally held on a Sunday, which is usually the case in Roman Catholic countries, the Sunday being made a day of recreation and enjoyment, rather than one of rest and religious observance, as with us, and the whole place is occupied with stands or moveable stalls, for the display of the articles and produce to be sold. The Indians attend the market for many miles round, the city forming the centre of a large district, the produce of which is brought to this market; and they frequently arrive the previous evening, and take up their abode for the night under the arcades that are erected in front of the stores and public buildings.

It is no uncommon thing, if one is out after dark, to find numbers of men, women, and children stretched across the side-path,—in fact, pedestrians frequently stumble over them,—and their couch is the hard paving covered with Mexican matting (which is nicely and skilfully made) and their "serapes;" and by early dawn they are up and stirring, selecting their standing in the market, and preparing to display their wares and produce.

The whole of the area of the Plaza is occupied for the market, except a thoroughfare on each side, which is used for the traffic of the country, diligences, mule-trains, &c., and the stands and stalls are fixed in rows, with avenues between them, running up the square, for the public to obtain access to them; and they frequently make a fine display of fruit and vegetables, both tropical and of the European species, that would gratify the most fastidious taste, dried meats, and crockery, and, though last, not least, the national stall of tortillas and frijoles, around which you may see crowds of Indians gathered, devouring the favourite diet with much gusto—indeed, as fast as the female vendor can prepare them. To protect themselves from the weather, either the rains or the tropical sun, they frequently erect covers of matting on a light framework, or on a pole with cross-piece attached to the end, upon which they stretch a piece of matting, something like a large umbrella, and this they move about on the other end of the pole as its axis as the sun changes its position or the rainfall drives, so as to shelter themselves effectually; and the different shapes and original forms of these coverings are striking and sometimes ludicrous, and with the moving figures of the people and the bustle of the throng, the scene is highly animated and interesting, particularly when we add the variety of costumes to the groups, amongst them not the least interesting the Indian women with their brown faces and jet black hair in tresses hanging down their backs, and dressed in white ornamented robes, broad "sombreros," and gay-coloured serapes, the men also attired in white shirts or slops, short-legged trousers or drawers, the broad Mexican hat, sandals, and serapes, the whole combined forming a very picturesque, stirring, and strange scene to English eyes in the glowing climes of the tropics, with clear unclouded skies, and a brilliant sun, setting everything off to the brightest and best advantage.

The bustle of the market takes place in the early morning: as noon approaches the throng sensibly diminishes, and towards three o'clock there is a general clearance as the time for "evening vespers" approaches, which they attend in great numbers, depositing in the offertory as they enter the cathedral their mites to support the splendour and gorgeousness of their religious establishment, and to satisfy the wants of a grasping, overbearing, and dominant priesthood.

After the market and vespers are over they make what purchases they require at the stores, and return to their homes, sometimes on mules, horses, or on foot, and it is very rarely you see any of them intoxicated, although "aguadente and pulky" are plentiful. Occasionally such scenes may be witnessed; but whatever their other faults, it cannot be said they are greatly addicted to drunkenness.

Having briefly described the Plaza, we may further observe that the streets of the city are well and regularly laid out and built upon, and at frequent intervals you meet with large and imposing buildings,—the town mansions of some of the many-acred Dons of Mexico,—at others the stores or "tiendas" for the sale of goods and merchandise, and each merchant sells a motley variety of articles, almost everything you require, a sort of jack-of-all-trades or general merchant on a small scale.

The "tiendas" are sometimes made out of some of the apartments of the town mansion, generally a corner room, so as not to interfere much with the occupation of the other part of the house, and some of them appropriate rooms open to the street for billiards, so that the passing stranger may soon be made acquainted with the Mexicans' evil habit and desperate passion for gambling; and these rooms are frequently kept open all night, gaily decorated and lighted up to make it attractive, and you might hear the stroke of the cue, and the click of the balls, and the shout of triumph or the groan of despair, and sometimes the deadly strife in the dead hour of night, when one was hoping to obtain repose from the fatigues of the past day, and to gather strength for the trials of the morrow.

At the corners of some of the streets you would meet with large buildings, formerly churches or chapels, at others nunneries; and these are mostly in ruins, brought about by their perpetual intestinal wars, as they have been used as places of military defence, and have been broken down and destroyed when carried by assault.

Most of the buildings, both public and private, of this city, exhibit numerous marks of being struck by cannon shot and bullets upon the stone and wood work from the frequent battles that have occurred in the streets, spreading death and desolation around, and have left these enduring mementoes of their bellicose propensities, and their love of the gay guerilla's life.

This city was originally laid out on a bold and magnificent scale, and intended to be one of considerable extent and importance, as from its geographical and physical position it was well and admirably adapted; but the original conception was not fully and properly carried out, as a considerable extent of the part laid out is still unbuilt upon, and this space is devoted to gardens or plantations, and generally cultivated, and on which grows the valuable produce of the tropics: thus the orange, lemon, lime, banana,

* To be continued.

† See also p. 7, *ante*.

and mango, and other fine fruits luxuriate; also coffee, sugar-cane, cocoa, and tobacco, and, at the season of the year when they are in full blossom, the beauty of the bloom delights the eye, and their refreshing fragrance scents the very air around with delicious perfume.

In addition to the beauty of the fruit and vegetable productions of these gardens, we must not omit to mention the splendid tropical flowers that adorn the fences, that separate them from the roadways, jessamines, Virginia creepers, purple wreaths, roses, &c., flourish in all their wild magnificence and beauty, enlivening the dark-green foliage with their brilliant and many-coloured blossoms, and shedding their sweetness on the desert air.

These suburban roads are much used as pleasant walks by the inhabitants towards the cool shades of evening, to breathe the pure and calm air of heaven and admire the glowing beauties of the gorgeous setting sun, and the bright and sparkling flowers, and indulge in the fragrant cigarro or cigarette.

The carriageways of the streets of the city are laid out on a different principle to that adopted in our towns, the channels are formed down the middle of the carriageway, which carries away the surface drainage, and the flood-water in times of heavy tropical rains, without incommoding the houses or the side-paths; there is a gradual declivity in the cross section from the sides towards the centre, and the side-paths are flagged, with a curb-stone; at other parts it is formed of small broken stones grouted and plastered over (a sort of concrete), which makes a hard and enduring surface.

The streets are usually well paved with regularly sorted boulder-stones, well arranged and set, which system might be profitably copied by many of our towns authorities who are not proverbial for well-paved streets of this kind.

The drainage is principally on the surface, and to cesspools situated at the rear of the premises, which filter away through the crevices of the rocky foundation on which the city is built.

The water supply is obtained by means of pipes laid from the stream that flows from the adjacent mountains, brought in pipes and delivered into tanks situated in the Plaza; but recently a lofty obelisk has been erected in the centre of the Plaza about 30 ft. high, the base of which is 4 ft. square and 10 ft. high, and the shaft 2 ft. square, tapering to nearly a point at the top, surmounted with a gilded star. Around the obelisk is constructed a circular tank to receive the water that falls from four fountains fixed at each angle of the base of the obelisk. The whole is elaborately ornamented with the egg and tongue and other mouldings, and a gilded wreath on each of the sides.

The obelisk was erected entirely of small rubble stone to the top, and smoothly plastered over, the mouldings, and the ornaments are also made of plaster, which appears to be well and substantially executed,—a remarkable and striking instance of what may be accomplished in small rubble masonry when well and properly put together.

The obelisk was commenced and completed while the writer resided there, and the day of inauguration selected was the anniversary of the one on which the Mexicans achieved their independence! Poor benighted creatures! to fall into a worse species of despotism—the despotism of mob law, or the strong arm of unprincipled chiefs.

Besides the cathedral, there are several other ecclesiastical buildings in other parts of the city, but one only except the cathedral is now used for religious worship. The system of architecture generally adopted is the Spanish, adapted from the Moresque or Saracenic styles, rather roughly executed on the exterior, and very sparingly ornamented; and where it exists it is executed in plaster. The domes are generally covered with coloured porcelain, of diverse pattern, which produces a light and bright effect when viewed from a distance, and under the bright rays of a dazzling tropical sun.

There are also some nunneries executed in the same style, covering a considerable extent of ground, and doubtless affording accommodation at one time to a great number of nuns and their attendants; but these are all scattered by revolution or civil war, and confiscation. The premises are deserted, and nothing but bare walls and roof remain. The churches that are in ruins and these monasteries were taken possession of by the French troops, and used for barracks for the soldiers and stables for their horses; and during the time the writer was there, these interesting buildings were destroyed piecemeal by the troops for the wood for camp-fires, or in a wanton spirit of mischief.

Such is the bane of war and conquest. It too often happens, instead of being the means of spreading civilization, and disseminating abroad a spirit of subordination and good order, it produces an opposite effect, desolating the country, destroying important and interesting buildings, and instilling into the inhabitants a spirit of vengeance, retribution, and anarchy. In the instance alluded to I have no hesitation in saying that the high-handed conduct of the French troops annoyed and exasperated the Mexicans, making them reckless to the consequences, and resolved to destroy everything that afforded a stronghold or a convenience to the French; and that accounts for the very ruinous and dilapidated state many of the Mexican cities now present since the evacuation of the French troops. The writer has seen them pull down and destroy interesting buildings, and has cried shame upon them; but the spirit of war and plunder was abroad: as the poet says,—

"Cry havoc, and let slip the dogs of war."

The lighter part of the religious paraphernalia of these structures, we suppose, had been carried off, but much of the interior gorgeous decoration still remained, broken up, scattered about the building in glorious confusion, and inducing one to moralize on the sad spectacle, and to deplore the necessity and misery of war, that produces so much needless wreck and desolation.*

NAMES ENDING IN "ON."

WE have recently, on more than one occasion, drawn attention to some striking coincidences;—coincidences in names and trades, coincidences in averages, and so on: the fact that the same number of thousands will, each week, for many weeks together, visit some public museum, or go night after night with few to spare to some particular dramatic entertainment. Boxed up alone in a railway carriage a few nights ago, the observation, belonging to the same class of facts, occurred to us that a large proportion of our most eminent men in their various paths bear a name ending in "on." Thus we have,—

Bacon, our greatest philosopher; Byron and Thomson, our greatest descriptive poets; Clarkson, Buxton, and Colston, some of our greatest philanthropists; Gibbon, our most eminent historian; Clarendon, not far short; Gibson, one of our best sculptors; Hilton and Haydon, amongst our best historical painters; Incledon, our greatest ballad-singer; Jameson, our greatest female writer on art; Johnson and Addison, our most distinguished essayists; Lytton, our greatest living novel-writer; Milton, our greatest epic poet; Murchison, our most distinguished geologist; Newton, our greatest astronomer; Palmerston, the most English of statesmen; Stephenson, our greatest railway engineer; Tennyson, our greatest living poet; Wellington, our greatest military commander (with Napoleon for adversary); and Nelson, our greatest sea-captain.

As amongst men of lesser rank, Ben Jonson, Chatterton, Hutton, Wharton, Emerson, Simpson, John Britton, Alison, Paxton, Rawlinson, Bonnington, Watson Gordon, Noel Paton, Hepworth Dixon, Mark Lemon, Gardner Wilkinson, James Fergusson, Donaldson, Sir Thomas Watson (our first physician), and many others will recur to the memory. Surely this is very remarkable, and, so far as we know, the observation has never been made before. All these names speak of progress: they cry, "Excelsior!" Echo herself says, as each name is repeated, "ON!"

The circumstances that London may be given as the scene of their labours, and that these lines were penned in Brompton, may serve curiously to carry on the terminal coincidence, though they do not bear on the original observation.

TRAMWAYS IN LONDON.—The vestry of St. George's, Southwark, contemplate laying down a tramway in the centre of the London-road, for the use of all kinds of vehicles, according to the *South London Press*. If successful, similar trams will be adopted on other roads in the parish.

* To be continued.

CONCRETE SEWERS.

SIR,—The article which appeared in the *Builder* on the 4th instant relative to the concrete sewers constructed by me at Sidmouth, Devon, has induced many gentlemen to write to me, asking for information as to the best shape for concrete sewers, the proper materials to be used in their construction, and the best method of executing the work.* As this question is of great public importance, I should be obliged if you would kindly permit me to reply thereto in the pages of the *Builder*.

In the drainage of towns two classes of sewers are put down, namely, main or outfall sewers, and branch-sewers. As the latter collect the drainage from the houses and deliver it into the former, the streams running in the latter are usually small, becoming at times mere driblets, while those running in the former are usually large, becoming, in times of heavy rain, considerable torrents. As the sewers are also laid at various depths in the ground, for properly draining the houses, they are subject to great strains from the weight of the surrounding earth. It is necessary, therefore, that both classes of sewers should be made of proportional capacity for receiving the sewage and rainfall from the houses, streets, and districts which they are to drain; and also of suitable form, not only for imparting velocity to the currents, and so aiding the discharge of the sewage, but for sustaining the lateral and vertical pressure of the ground.

For main or outfall sewers, the best form is undoubtedly that of a circle, for three reasons,—1st, because the circle offers the greatest resistence at all points to the pressure of the surrounding earth; 2nd, because the circle affords the largest transverse area or capacity for receiving the sewage from the branch sewers, with the smallest quantity of materials and labour in construction; and, 3rd, because the circle offers the least periphery, or frictional surface, to the flow of the sewage, with the same amount of inclination.

For branch sewers the best shape is unquestionably that of an egg, with the narrow end downwards, for three reasons:—1st, because the egg-shape, like the circle, while it possesses the property of resisting the pressure of the earth around it, distributes the weight thereof throughout the thickness of the arch without collapsing; second, because the egg-shape, like the circle, while it affords the largest capacity for receiving the sewage and rainfall from the houses, requires the least consumption of materials and labour in constructing it; and, third, because the egg-shape, with the narrow end downwards, forms a deeply-curved channel, which, by concentrating the drainage and heaping it up on a small frictional surface, imparts the utmost scouring power to the stream, and enables it to hold in suspension and carry away the heavier matters discharged into the sewers by the house-drains, without deposit or accumulation.

Hence the circle for main or outfall sewers, and the egg-shape for branch sewers, are not only the strongest and cheapest, but the most efficient forms that can be adopted.

The above principles, the result of much observation, practical experience, and study of the subject, were advocated by me first in the *Builder*, and before the Westminster Commissioners of Sewers in 1845; and subsequently before the Metropolitan Sanitary Commission in 1847. They were afterwards adopted by the Metropolitan Commission of Sewers, and also by the present Metropolitan Board of Works when it came into power. In fact, the plans, sections, specifications, and schedules for sewers, gullies, and house-drains, now in use by the Metropolitan Board of Works, by the Metropolitan District Boards and Vestries, and by Local Boards of Health throughout the country, are either those which were drawn by me between eighteen and twenty years ago, or modifications of them. This can be verified by reference to my original reports, drawings, specifications, and schedules at the office of the Metropolitan Board of Works. I may also observe that glazed stoneware pipes, which have been so extensively used in the drainage of towns, and in the drainage of houses, and by means of which brick-drains have been

* With reference to a letter in our last signed "Walter Bradbury," Mr. Phillips writes denying the correctness of the statement it contains, and describing the circumstances which have led to the writer's misconception. We have also received letters from the Chairman of the Local Board, and the Editor of the *Sidmouth Journal* to the same effect. It is unnecessary to insert them, and we must decline any controversy on the subject.—ED.

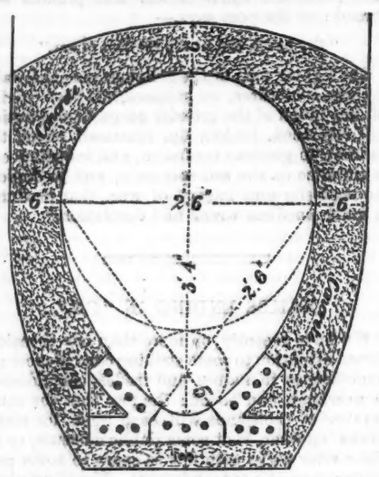
entirely superseded, were first practically used by me for house-draining and sewerage purposes in the metropolis in 1845. The benefits derived by the ratepayers in reduced rates, and in increased comfort and health, by the adoption of these principles, I will not now dwell upon, but they must have been very considerable.

Formerly it was the practice to build sewers without reference to any general arrangement as to plan, fall, or sizes, with wide flat bottoms and upright sides, and of inferior bricks and mortar,—the bricks in the inverts being laid dry, or sometimes grouted. Part of the liquid discharged into these sewers from the house-drains was thus lost by soakage in the ground beneath, while the remainder, by being spread over wide flat surfaces, had no scouring power to keep the sewers free from decomposing deposit. The consequence was, that the sewers gradually choked up until the outlets of the house-drains were buried, and could no longer discharge their contents; then complaints were made by housekeepers that the house-drains were stopped, upon which the sewers were examined, and emptied or cleansed, by hoisting the soil to the surface, and carting it away. Nothing could possibly be worse than this state of things, and the sewers in consequence acquired the not inappropriate name of "elongated cesspools." For some time as clerk of works, and subsequently as chief surveyor to the Westminster and Metropolitan Commissions of Sewers, I waded through miles and miles of these sewers almost daily for years, to the permanent injury of my health, for the purpose of examining their condition, experimenting on the currents, and discovering, if possible, a remedy for the evil. The remedy came at last by the introduction of egg-shaped sewers, with the narrow end downwards, and by their systematic arrangement as to plan, fall, and sizes. The materials used were also of the very best quality, consisting of good, hard-burnt, square bricks, laid solidly in cement in the inverts, and in lias lime mortar in the sides and crowns. New plans of trapped gullies, with pipe-drains, were also adopted and largely used in the districts. Architects and builders were also "educated" in the principles of house-drainage, and strongly urged to abandon brick drains for houses, and to use the cheaper and more efficient stoneware pipe-drains instead. Permeable brick-drains, which are now the exception, were then the rule for house-drainage. The saving to the rate-payers, and also to builders, by these improvements, has been enormous. I hope I am mistaken, but I believe the Metropolitan Board of Works knows little or nothing of what the condition of the metropolitan sewers was in years gone by. I think they have no idea of the great labour and persistent study which I gave to the subject day and night for years, for the purpose of bringing to perfection the improved system referred to, and upon which their drainage works have been and are still being executed by their officers. This, of course, is known to few persons, but the general public are now unacquainted with it after the lapse of so many years. The practice now is to build the sewers with bricks specially made for the purpose, laid in Portland cement, and to give to the face of the work the utmost degree of polish and finish. The expense of this method of construction is very great, *the labour alone costing from* 5*l.* to 8*l.* *per rod*, or from 9*s.* to 14*s.* per cubic yard.

The manufacture of Portland cement, of late years, has been brought to such perfection, that concrete made of it and clean sharp shingle or gravel, mixed in proper proportions, sets as hard and becomes as solid as ordinary stone,—indeed, so hard and solid does the admixture become in a week or two after it is made, that it would be as difficult to cut through it then as it would through Portland stone itself. As regards the use of concrete instead of bricks for sewers, there can be no doubt that if sewers be carefully constructed of this material, and with glazed stoneware invert blocks for the sewage to run on, they would become not only as strong and durable as brick sewers, but would cost considerably less. In truth, the cost would be about one-half that of the brick sewers, as now constructed,—that is, two miles could be laid at the present cost of one mile; and I have no hesitation in saying that they would be equally as sound, durable, and efficient. The inside surface above the inverts could be rendered quite even and smooth. The sewers which I have constructed of Portland cement concrete are perfectly hard and sound; indeed, they are like a stone throughout. The three courses of stoneware invert-blocks, with bird's-mouth joints, used in the works, were made and supplied by Mr. George Jennings, to whom we are indebted for many useful sanitary improvements and inventions.

By using concrete instead of bricks from the invert upwards, there is also this advantage, that the entire spaces between the centering and the excavation, can be filled up and rammed quite tight against the ground, which not only prevents the earth or gravel outside the excavation from giving way or subsiding, but enables the runner-planks or poling-boards to be drawn, and the spaces they occupy to be filled up solid with concrete as the work proceeds. In tunnelling, also, the whole space between the roof of the tunnel and the centering can be filled and solidly rammed with the concrete, which cannot be, or is not so well done when the arch is turned with bricks.

I submit herewith a section of an egg-shaped sewer, which I would recommend to be constructed in Portland cement concrete. The



Concrete Sewer.

height is as 4 to 3 of the width; the radius of the sides is equal to the width, and the radius of the invert is one-sixth of the width. The curves blend well together, and form a perfect egg-shape. The sides have more batter than is usual in egg-shaped sewers; but this I consider to be an advantage, inasmuch as the battering side-walls act like raking struts against the ground, and so tend to carry or deflect the weight down to or under the invert. The invert is also by this means made deep and narrow, which gives velocity to the current, and prevents, as before observed, any deposit from taking place.

The invert is formed of three courses of glazed stoneware blocks, in 18-in. lengths, with bird's-mouth joints. The blocks are perforated longitudinally with small round holes to facilitate the drying and hard-burning of the material in the interior, and to give a key to the cement at the end joints, which will prevent the sewage from leaking through and saturating the ground beneath. The blocks are laid solidly in concrete, properly jointed in cement, and half-bonded. The blocks so made are nearly solid (a most essential thing) and imperishable, and they are not likely to be broken or shivered by the weight. In fact, they are far superior to anything of the kind hitherto used for the purpose. By being glazed they also afford a perfectly smooth channel for the sewage to flow on.

The sides and crown of the sewer are formed of concrete, the thickness of which should vary with the depth in the ground; but ordinarily it may be about one-fifth of the internal width of the sewer. The concrete should be composed of six measures of clean sharp shingle, or well-washed gravel, not large, but of various sizes down to very coarse sand, and one measure of best-tested Portland cement. The ingredients should be turned over twice in a dry state on a gauging-board, then wetted, and again turned over twice, so as to ensure thorough admixture, before using. The concrete so made should then be well and solidly placed in the work, and when it has set hard enough the trench may be filled up and rammed, and the strutting removed, in the usual manner. The centering for supporting the concrete may consist of pairs of stout hard-wood, or T iron, half-ribs butting together at top, and resting on stout hard-wood foot-blocks, placed across the invert, blocks at bottom, with planed laggins (cleaned and oiled each time of using) laid loose on the ribs as the concrete is brought up. After the concrete has set and the ground is filled in, the centering can be easily removed by knocking away the foot-blocks. The face of the concrete can then be stopped and pointed, and made quite even and smooth with cement.

JOHN PHILLIPS.

VENTILATION.

IN the 18th of January number of the *Builder*, Mr. Leeds has discussed, in some detail, statements made by me in a communication which appeared in the number for the 14th of September last, on the mode of ventilation adopted for the Drummond School. I beg, before commenting on his remarks, to thank him for the courteous terms in which he has animadverted on what he considers to be my erroneous operations and conclusions, and at the same time to thank him for pointing out, for the benefit of your readers, those matters which require from me further elucidation, as well as those inferences drawn by me which he deems to be wholly untenable. *In limine*, however, I must protest against an assumption which appears in more than one part of Mr. Leeds's remarks, and which I cannot perceive to be warranted by anything which appears in the paper which you did me the favour to print. He says he thinks the theories upon which I have based my operations are entirely incorrect, and that I have been mistaken as to the results; and again, lower down, that my neglect of variations of temperature and density vitiates my theory. Now I beg to assure Mr. Leeds that I have no theory whatever to uphold; and if, as I believe it does, a theory means a true explanation of all the phenomena present, then I can further state that I am unable to offer explanation of many of the facts (noticed in the paper) which fell under the observation of myself and friends.

Mr. Leeds contrasts the mode carried out by me at the Drummond School with that of which he himself approves, and marvels at the discrepancy of our views; but it ought not to have escaped his penetration that he and I approach the subject under very different conditions: he has a prolonged and intensely cold winter to contend against, has abundance of fuel, and ample means at his disposal, and propels heated air into an air-tight compartment with two holes in it, one for the admission of the warmed air, the other for the escape of that which is displaced; while here at the Drummond School, since it has been opened there have not been twenty fires lighted in any of the sleeping-rooms, for the simple reason that we did not need them, and cannot well afford them: nor at the Royal Hibernian Military School, one wing of which is provided with Ross & Murray's batteries for heating, has warmed air been passed into the dormitories a dozen times these three years. Herein lies an amazing difference, quite enough to justify me in adhering to the present plan until it can be shown to be insufficient or objectionable: it, moreover, has certainly the merit of being very inexpensive.

Mr. Leeds next gives reasons for thinking that I have mistaken the results which I had supposed to have been realized, and which appeared to me to be so perfectly satisfactory. To this I am a little puzzled how to reply, further than to say that the facts were as I described them, and were recognised as facts by competent judges; that I took the readiest measures which suggested themselves to me for remedying the evils I perceived to exist, and that I was gratified to find an amount of success I had hoped for but had scarcely anticipated. That the house was in a bad state and unhealthy, can admit of no doubt; that it is eminently the contrary now is just as certain*—the conditions remaining precisely the same, excepting that the ventilators were introduced as described. Mr. Leeds computes accurately the amount of air intro-

* We have within the last few years passed through two epidemics, one of cholera, very prevalent in our immediate neighbourhood without any of the boys being affected: the last, just passed off, scarlatina, of most fatal character in all directions about us, eighteen boys were admitted into hospital, and not mild cases either; but so healthy are they that the fever and sore throat disappeared in four or five days, ushering in a rapid convalescence. I could point to a time in this very school, before sanitary matters engaged so much attention as they have done since the Crimean war, when during an epidemic boys died at the rate of one a week: it is not so now.

duced by the ventilators,* and finds it far too insignificant in quantity to permit him to entertain the notion that the results are solely dependent on them: in this he is so far right that the rooms do not depend on the ventilators exclusively, the windows and doors are by no means close fitting, but with the small steadily inflowing current through the ventilators which communicates motion to the mass, there proves to be sufficient to preserve the inmates in excellent health, provided their numbers be carefully adjusted to the area of the room. The fact is, my early difficulty was to know where to stop when enough, yet not too much, was being introduced through the ventilator, and this amount was only arrived at after several years' experience. I have been somewhat more enterprising lately, and have enlarged the ventilators; two of 2 ft. 6 in. by 6 in. having been introduced at a height of 13 ft. into a room at each side; but the room (664 ft. area) in this instance is not a sleeping apartment, though a large number of persons are in it at a time. It will be seen from the accompanying letter that the ventilation has been successful. But I should doubt the propriety of such a large quantity of air finding admission at a time when all the inmates were, being asleep, in a state of passive resistance. In reality, the purpose to which the rooms are applied and the area told off to each person must be taken into account.

"I beg to state for your information, that on my assuming the duties of 'Band Master' at this institution, I found the band-room to be, from want of pure air, most unhealthy, and, in fact, totally unfit for the purpose of practice. When the boys, to the number of fifty, were assembled in the room, for instruction, I found the stifling air and unpleasant smell most offensive, and to these causes I attribute a fit of illness which confined me to my bed for some time.

I have now to state that having reported this condition of the room to the commandant, he most promptly satisfied himself of the accuracy of my statements, and caused a thorough reformation to be made.

The room, which is about 25 ft. square and 20 ft. high, is now well ventilated, wholesome, and comfortable.

I have never since felt any sensible draught nor undue lowering of temperature, and I may also state that the walls which used to be streaming with water are now always dry. A. Baily, Band Master R.H.M. School."

Since, then, we do not in these countries seal up our rooms and urge into them the entire of the air to be consumed, it behoves us to take every care to preserve the utmost purity in our rooms that may be practicable, by assisting natural ventilation in unobjectionable ways, and by cutting off all sources of noxious emanations.

Our first duty is to see that all sleeping-rooms, intended to be occupied by as large a number of persons as can be suitably accommodated, have fine open fireplaces with well-constructed chimneys. At one time, cast-iron stoves were largely introduced into barrack-rooms and dormitories on the fallacious pretence of economy. This was a serious mistake. In the first place, it deprived us of a most effective means of ventilation; next, it is by no means certain that the whole of the products of combustion are removed by the smoke-flue; lastly, depending almost entirely on connexion for diffusion of heat, the radiating power being exceedingly low, the exposed surface was quite inadequate† to generate the heated air with sufficient rapidity or in anything like sufficient quantity; and the air so warmed was carried to a part of the room where it was not wanted, and where it was speedily and uselessly dissipated if proper ventilation were maintained. What we desire to have is a plentiful efflux of radiant heat from a large open fireplace; and, to gain as much effect as possible from the fuel, the grate should expose a broad front to the room, with as little fore-and-aft depth as may be practicable and convenient.

When it is borne in mind that each fan gas-light is equivalent to the addition of four men to the occupants of a room, the importance of rapidly removing the carbonic acid, watery vapour, and other deleterious products, cannot be overlooked. Unless where some positive necessity exists, it would be far better, in lieu of gas escapes, which are troublesome to put up, and not entirely effective, to place the lights outside the room. The jets would then occupy the position of wall-shades, be at about 5½ ft. from the ground, and in long rooms be placed alternately on opposite sides of the room. The jets should not be countersunk, should be cut off from the room by thickish curved glass-plate, and have a plentiful supply of fresh air from below to prevent undue heating.* Behind the gas jet should be two silvered reflectors, inclined at an angle of 130° to 140° to each other; and I find that glass silvered by precipitation with oil of cloves stands the heat well, but silvered metal plates may be preferred. The gas-escape pipe must lead into the roof (never into the chimney or outside the house), which always has sufficient leakage for the removal of the produced gases, and the steadiness of the flame is unaffected on a stormy night.

At one time the urinals and privies connected, for night use, with the dormitories of the Royal Hibernian Military School, were exceedingly unpleasant, notwithstanding that every care was taken by plentiful ablution, open windows, and well-fitting doors, to prevent any smell from them penetrating into the dormitories. Boys in the vicinity of the door leading to them suffered from ophthalmia, and it is possible their health was otherwise injuriously affected. This was obviated so completely some time back, that a description of the plan adopted cannot be otherwise than interesting to those who are watching sanitary improvements.

The urinals and privies are placed in a nearly square tower in rear of the dormitories; on each story a well-aired passage leads into them. The urinal is sheeted with ¾-in. plate glass, a yard high, carefully cemented to the back wall, and along the upper edge a brass pipe sheds water over the surface continuously at night. The channel course is also of glass plate, and leads into a well-trapped sewer-pipe, so that everything here is as near perfection as may be. A difficulty was felt about the flooring of the urinal, it being very difficult to get the boys in the middle of the night to invariably go quite forward to the wall, and this is the only not quite satisfactory part of the arrangements. The floor declines to the channel course about an inch the foot, and is covered with sheet lead, but, being so cold under the boys' feet, is covered at night with a deal grating, which is carefully washed and deodorized each morning: notwithstanding every care, however, the grating acquires in time a urinous smell; it is then removed, burnt, and replaced by a new one. The privies, which are not often used, are on Macfarlane's principle "improved" and are very satisfactory. At the dormitory end of the passage, leading from the urinals, is a carefully boarded-in compartment (each board rebated into that adjoining it), 10 ft. high and 5 ft. 9 in. by 5 ft. 9 in. in area: it projects 2 ft. into the dormitory, and has double doors in front and rear, closing with very strong springs, so that in passing in and out one set of doors must be securely closed before the other set can be reached to open. Right above head, nearly in the centre of the compartment, a jet of gas burns all night, which, through the fan-lights in front and rear, and in so much of the sides as projects in front of the wall, gives light to the urinal and to the dormitory. Above the lamp is a conical inverted funnel, with an eduction pipe for the escape of the heated products of the combustion of the gas and of any impure air from the urinals which may be carried up along with them. A visit to the end of this pipe in the roof will satisfy the most sceptical that this operation is conducted to a successful issue.†

What I have been describing has been some time in use, and the purity of the air in the dormitory is now completely preserved thereby from this source of contamination.

I cannot do better than conclude these remarks with the following quotation, which announces in terse language the problem to be solved in these countries.

"How to supply at all seasons and temperatures, and by day and night, each room by itself, and independently of every other room, with a sufficiency of air to keep the room healthy, and at the same time to prevent the temperature from falling below what is required for the comfort of the men. To do this with the least possible interference with the structure of the rooms, on a plan not easily deranged, and at a minimum of cost."

We believe in these schools that we have advanced a step. Robert Templeton,
Deputy-Inspector General, Dublin.

THE EDUCATION OF AN ARCHITECT.

At a meeting of the Architectural Institute of Scotland, held in Edinburgh, on the 3rd inst., a paper on "The Education of a Young Architect" was read by Mr. Gowans. In the course of his remarks, Mr. Gowans said,—No man can be proficient in the science of architecture unless he has studied the theory and practice of it—the two being so closely linked to each other that the want of a knowledge of either is sure to be fatal to the success of any one who adopts architecture as his profession. This being so, no question to my mind is of more consequence to the rise of architecture than that of "Whether architectural students receive such an education as will make the most of their abilities and do justice to the science?" I am strongly of opinion that there is no thorough system for the study of architecture, and that it is lagging behind the sister arts in consequence, and therefore it is that I have brought the subject of this paper before you. There is a great cry-out at the present time for technical education; and, although no amount of such an education will ever result in imbuing that genius which the architect requires, still, in the maturing of the architect it is indispensable. Architecture, in my opinion, suffers from causes which sculpture and painting, in a great measure, are not liable to. As it would serve no practical use for me to point out what I consider to be the drawbacks to the progress of architecture without being prepared to suggest that which would be a remedy, I venture to bring before you what I consider necessary for providing the means of training which the architectural student should have within his reach. First, as to geometry: there is no doubt in my mind that geometry is at the root of all design, and that nothing good in architecture can be done without it. A thorough knowledge and application of geometry by architects would not only advance themselves, but would tend to educate or call for a better education of those who had the carrying out of their designs, as I am sorry to think that the builders in general know little at all of the science of their business; and to go from them to the workmen, I know as a fact that few of them know more than the use of the tools which are put into their hands. Second, as to geology, or, perhaps, mineralogy, these may be considered by some as outside of architecture; but I hold otherwise, as it requires few words to show the value of a knowledge to an architect of the stratification of the country from which he must get his material for building. The want of this knowledge in architects and engineers I have known to lead to useless expense, in carrying material from distances, while material equally suited for their purpose, and better adapted to the nature of the district, was lying almost underneath the structure they were erecting. And let me notice this, that if an engineer or an architect, from his geological knowledge, knows that a certain kind of material is within reach, the nature of this material in its structural use should determine the style of his buildings; and, if this be done, he may be sure that the structure he erects will always harmonise with the district. Third, the nature and strength of material, and the true application of it. Every kind of material requires a special constructive application—wood, iron, and stones require different treatment—that is, taking them separately; and when combined, it requires very great care indeed to use them so that they may amalgamate together, and bring about the required result. Mr. Gowans, after giving some hints as to the treatment of different kinds of stones, and also as to the application of iron for building purposes, said:—Fourth, light and its properties. Now that there is no tax upon

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* Mr. Leeds is mistaken in believing that complete stagnation takes place in these countries even on the stillest nights. He likewise apprehends that the perforations would be closed by dust in six months. I can certify that after many years the perforations are as clear and free from dust as on the day they were put up.

† Defect of surface is equally recognizable as the grand cause of failure of all attempts to heat buildings with hot water; one large tube or pipe is to be found where there should be a dozen of very much smaller size; but I regard the intervention of hot water as a clumsy device, there being no reason why a portion of the air propelled into the room should not be directly heated in unoxydisable conduits or pipes: it would require but a small exercise of ingenuity to regulate the temperature of the inflowing current by a governor, which might require a daily adjustment to a fresh zero point as the season advanced. I wish to except from my sweeping condemnation of stoves a little American one, made of sheet iron, which we used in the hills: it got speedily red hot with wood fuel, and sent its gleams forth with marvellous effect.

* A small tube, with longitudinal slits or perforations, should lead up to the jet from the room, be filled with gas at half-turn of the stop-cock, so that the jet may be lighted; but closed off when the gas is full on.

In private houses a narrow frosted or tinted stripe should traverse the plate-glass, so as to cut off the glare when standing or sitting in part of the room usually occupied by the family, otherwise the more light in the room the better. It is more trying to the eyes to be in an ill-lighted room than when the illumination is equal to that of daylight.

† Of course if it were necessary ventilators could be introduced into the roof without any fear of the gas being put out on a stormy night.

either the number or size of windows, it is wrong to shut out what conduces not only to health but to cleanliness, and yet you find buildings being erected at the present time where closets and such-like places are lighted by openings of the very smallest possible dimensions.

Another important point in the proper arrangement of a house, which is very much abused, is the position of water-closets, sculleries, and such places, which require the utmost amount of ventilation and light that can be got. Houses are now being erected where these places are in the centre of the building, and lighted and ventilated from the common stair, notwithstanding the clause in the Provisional Order recently got by the city, whereby it is provided "that all such places should be ventilated from the outer air." The proper drainage and piping of a building should also form the careful study of the architectural student. If water-closets and such places be in their proper position, neither the sewage-drain nor water-pipes require to go further into the building than the thickness of the outer wall. The ventilation and the elastic properties of foul and impure air are also worthy the attention of the student. The position of the various apartments also requires to be carefully considered, and disposed so as to receive the greatest possible quantity of light and air, and have free access without passing from one into another. After referring at some length to the laws of proportion and the principles which guided the Greek and Gothic architects, Mr. Gowans concluded as follows:—There is nothing I wish for so much as that some lover of architecture who has the means at command would endow a chair of architecture in the same liberal manner as has been done by Sir David Baxter for engineering; and I am satisfied that no monument would be so lasting as a chair of this nature would, as the beneficial effects of architecture along with other arts are not easily traced, and never die.

THE GROWTH OF LIVERPOOL.

AT the last meeting of the Liverpool Architectural Society Mr. Samuel Huggins read a paper on "The Growth of Liverpool and its Architectural Results." The rapid growth of Liverpool, he said, had been among the marvels of the present age; perhaps it was as unrivalled as regarded the quality of the material which in the course of its enlargement had entered into its composition. While the old or business part of the town had undergone one continued process of improvement in architectural character, the private department, or that devoted to residences, had retrograded. The extension of Liverpool in every direction had been mainly by the erection of dwellings for the poorer classes of people, and this had been left for the most part to men profoundly ignorant of art, and with scarcely an idea in their heads; and the consequence was that art in these productions had not only been ignored as out of the question, but a degree of meanness and wretchedness had extended over wide districts of this town that could scarcely have been deemed possible by those who had seen its pristine beauty. But he should not have brought this matter forward but for the conviction that these things had been growing worse of late, and that at no former period had such houses been built as were then obtruding themselves on the pleasantest and most respectable neighbourhoods. Assuredly a more melancholy contrast was never presented in architecture than was then presenting between the character and quality of the buildings they were pulling down and those they were rearing up. He was quite sure the New Zealanders would build for themselves, with the same means and materials at command, more pleasant-looking, less heart-sickening habitations than those now rearing in many parts of the town, which appeared to him more like a superior class of pigstyes than abodes of humanity. The destruction was not confined to one locality. Every beautiful and retired spot of private residence, in whatever direction in the town, north, east, or south, was in course of destruction; and there was not a private house or neighbourhood anywhere but was in danger of being at any moment rendered valueless for private and genteel abode, not by the erection of small houses, but of ill-built houses. He had little hope of any effectual remedy for the evil being forthcoming: a new building Act might do something. But nothing less than the extension of legal protection to certain neighbourhoods would be effectual;—protection by laws which would be no more inimical to the proper and rational liberty of the subject than those that were enacted against theft. The remedy he mentioned had not been, and probably would not, for some time, be applied, owing to the indifference to architecture that everywhere prevailed, and was operating prejudicially on most of our towns and cities. A striking instance was seen of it at Chester, which had lately exchanged some of its characteristic and best Italian buildings for the most entire abortions that ever insulted the eye. Even the cathedral itself was in danger at least of serious injury, and had been already roughly handled by the new dean in the course of carrying out some new arrangements for the public services. Dr. Howson would, he had no doubt, in other ways do honour to his new appointment and to the church; but, from what had already occurred, the friends of art had reason to tremble for the material church in such hands. It was under the impression that it was the duty of all who felt this to raise their voice in the matter that he now ventured a word in behalf of the venerable pile, the nave of which, hitherto unbroken by bench or pew, was dotted all over with a myriad of little bedroom chairs of the meanest and slimmest description, furnished by the maker, he was told, at 1s. 9d. a piece. There was talk of restoring the cathedral, which to the ear of an artist simply meant destroying—destroying its antiquarian and historic interest and picturesque beauty. The most important operation in the central or business part of the town was the erection of the new Exchange-buildings. In a former notice of this work he had condemned it for being dissimilar in style from the old one, and so departing from that of the Town-hall. But, on a walk round it the other evening, he was glad to perceive an advantage resulting from this which had escaped him before, namely, that he had caused it to become one with the chief buildings around it, uniting several hitherto dissevered blocks of commercial buildings into one continuous series. It united, for instance, Mr. Cockerell's block on the east of it with Messrs. Picton & Son's on the west, and so on of others at the northern extremities, till there would, when it was finished, be a complete district of fine commercial buildings, all in perfect accord, and unmistakeably commercial in character, that he believed the metropolis only could parallel in this country.

THE WANT OF A FEVER HOSPITAL IN BRISTOL.

LAST week Mr. Alderman Proctor attended before the sitting magistrates, to ask their advice on an important matter, with which he felt himself unable to deal. A very respectable man, whom he had known for some time, kept a lodging-house; and about a fortnight ago a man, named Paul, who came from Cheltenham, took up his lodgings there. This man, it appeared, was now ill of maculated typhus fever, and he was in such a state that it was exceedingly dangerous for the owner of the lodging-house to remain there. He had called the attention of the officer of health, Mr. Davies, to the case, and Mr. Davies had written a letter, in which he showed that Paul, although he said he came from Cheltenham, lived in Picton-lane, Bristol, next door but one to Millett, now lying dead of fever there, where he had reported fever for three months. A fortnight last Saturday he (Thomas Paul) left Picton-lane for Cheltenham, and lodged there. After being there three days he sickened of his present complaint. He came back last Monday, and travelled in a railway carriage, in the middle of an attack of typhus fever. "If White and his family remain, White's life is not worth two months' purchase. Typhus has a great predilection for the life of the bread-winner. If we could get a separate house we might get Paul removed, but he will not go to the workhouse." He (Alderman Proctor) thus felt a difficulty in the case. It appeared that there was an Act of Parliament in force to the effect that if there was a place to send the patient to, the magistrates would be able to order his removal. Unfortunately there was no such place in existence in Bristol, and it was such an important matter that he felt it necessary to place the responsibility with the magistrates.

Mr. Brice, the magistrates' clerk, said an order for the removal of the patient himself to the workhouse had been obtained, but the patient would not avail himself of it because, as he said, he was not a pauper. Then the only course for the officer of health to take was to fall back upon the Act of Parliament, authorising Local Boards in different localities to provide hospitals for sick persons; and where such a hospital had been provided, there was power under the statute 29 & 30 Vic., chap. 90, section 26, as follows:—"Any justice may, with the consent of the superintending body of such hospital or place, order the removal to such hospital or place of such sick person." The short answer to that enactment was, that the Local Board of Health in Bristol, who were the nuisance authority under this Act of Parliament, had not provided such hospital or place; consequently, the application to the magistrates to remove a patient to a place not in existence would be simply ludicrous. It was not for him, nor probably for the bench, to say what was the duty of the Local Board; suffice it to say the necessary machinery did not exist, and let the consequences be what they might, the responsibility could not rest with the magistrates.

It is to be hoped the people of Bristol will watch this case; and will, moreover, immediately insist on the provision of a proper place to which such cases may be sent. An epidemic of typhus would be costly.

RESTORATION OF BRISTOL CATHEDRAL.

WITH grand Masonic ceremony, on the 17th of April, the corner stone of the nave of the Bristol Cathedral was laid by Lord Limerick, the Provincial Grand Master of the mystic craft.

In 1866 considerable alterations were made in the road at the north side of the cathedral, access on this side being improved by the removal of the earth to a depth of several feet. The excavations thus made laid open to view the foundations of a nave and north porch. Previously to these discoveries, a movement had already been set on foot for the completion of the cathedral by the erection of a nave. The public attention drawn to the discovery gave an impetus to the efforts of Canon Norris and his friends; the private subscriptions increased; and on the appointment of Mr. G. E. Street as architect, he submitted plans for the building of the nave with western frontage and steeples or towers. His report was considered at a public meeting in June, 1867. The general design of his plan was to copy very closely the work in the present choir, with a few minor alterations, such as the sections of mouldings, the design of window traceries, and the character of the sculpture, sufficiently to show that the new nave was really a work of the nineteenth century and not of the fourteenth. He believed, however, that this would be in such complete harmony with the old work that in the general *coup d'œil* no difference would be noticed between the two works. With regard to the west front, he believed that the old plan did not contemplate steeples, but in his opinion the cathedral would in all respects be a more striking and effective building if it were finished with two western steeples than if it had simply a nave and aisles corresponding with and very nearly repeating the outline of the existing eastern portion of the church. The addition of the nave and western steeples would give the whole a bulk and importance which would make the cathedral—as it ought to be—the most conspicuous object in the distant view of the city; and it would then have so unmistakeably the character of a cathedral church, that every one would be at once impressed with its appearance. The plan was adopted. The cost of the whole work was estimated at upwards of 50,000*l.*, and having obtained promises of subscriptions amounting to upwards of 15,000*l.*, the committee felt themselves in a position to commence work so early as October or November last.

The whole nave will have a length of 117 ft. from the transept tower, and a width of about 80 ft. It will be furnished with north and south-western towers, 130 ft. high, and have a northern and western frontage, and connected with it on the southern side will be the original cloisters, the architect having introduced an arcading or arched corridor in this part of his plan. The nave will be built of Doulting stone; and in harmony with the walls of the old portions of the structure, the new walls will be 5 or

6 ft. thick, with the triforium or passage running between the windows in a similar manner to the design of the present building. The first contract, comprising two of the six bays of the nave, and the foundations and walls of the whole of the remainder to a height of 6 ft. above the ground-line, was undertaken by Mr. George Booth, of Gosport, the contract being taken at a sum rather exceeding the amount of subscriptions promised up to the present time. On the completion of the two bays, it is proposed to close them in on the west side by the erection of a temporary wall, so that the cathedral will be provided with a short nave during the completion of the undertaking.

ST. MATTHEW'S CHURCH, HULL, COMPETITION.

THE following additional details have been furnished us in reference to the designs sent in for this church. The church is to hold 800 adults. The cost, including only lower portion of tower, was not to exceed 4,000*l*. The premium for the selected design is 25*l*. There were fifty-three competitors. The designs of all the competitors were numbered and arranged on tables and on the walls of a well-lighted room. The committee of selection, after spending several hours, picked out some twenty odd: from these ten were at the next meeting selected,—viz., those of Adams & Kelly, Leeds; Bellamy & Hardy, Lincoln; Benest, Norwich; Blessley, London; Clark & Son, Nottingham; Linklater, Manchester; W. H. Lockwood, London; Scammell & Inspipp, London; R. C. Sutton, Nottingham; and R. G. Thomas, Menai Bridge.

The result of two other meetings was to reduce the number to four—viz., Adams & Kelly, Blessley, Clark & Son, and Sutton; and finally the design of Messrs. Adams & Kelly was selected; the chairman having decided by his casting vote that it, and not that of Mr. Blessley, for which an equal number of votes had been recorded, should be taken.

The style of the proposed new church is Early Decorated Gothic. The total cost, with tower and spire completed, is to be 4,500*l*.

No names were furnished with plans marked "Delta" and "Let there be Light."

THE TRADES MOVEMENT.

WE understand that the Liverpool master builders and the bricklayers in their employ have just taken a step which may prevent in future any resort to locks-out or strikes to enforce changes in the rules of the trades. Both sides have agreed to a series of regulations, to come into operation next month, which will place all questions relating to overtime, country work, travelling expenses, payment of wages, &c., upon a basis satisfactory to all concerned; and they have also agreed, that in the event of any dispute arising, it shall be referred to a court of arbitration, composed of equal numbers of employers and workmen, with a final reference, if necessary, to an umpire. The rule headed "Authority of Employers" says,—

"Each employer shall conduct his business in any way he may think advantageous in the matter of letting piecework, taking apprentices, using machinery and implements, employment of society or non-society men, employment of town or country bricklayers, and in all details of management, not infringing the individual liberty of the workman."

Some London trades unions are about to call a conference between "large employers of labour and representative working men connected with trades unions, for the purpose of considering whether the relations between capital and labour cannot be brought into more harmonious action, whereby the disputes which are now constantly arising between those interests may be averted." By this means it is thought that some modification of objectionable rules may be obtained. The question of trades unions having caused trade to go from this country to foreign countries is to be entered upon, and the unionists or some of their leaders say that it would be well for an understanding to be come to between capital and labour, that feuds may be lessened and strikes and lock-outs limited by all subjects of difference being referred to arbitration.

A general meeting of the Yorkshire branch of the Master Builders' Association has been held at Wakefield, the chair being occupied by Mr. John Fawcett (Messrs. Wm. Fawcett & Son, builders), of Huddersfield. After certain formal business had been transacted, and the report of the committee, read by the secretary, Mr. Wm. Longley, of Badsworth, had been adopted, the consideration of payment of men by the hour came on for discussion, and after a number of the members had spoken on the subject, it was agreed that the principle was just, fair, and reasonable; and that information should be obtained on the subject, in order that the matter might be fully discussed at the annual meeting to be held at Hull in August next. At the dinner which followed the conference, the chair was occupied by Mr. Fawcett, and the vice-chair by Mr. Longley, and the speakers included Mr. Beanland (Bradford), Mr. Crofts (York), Messrs. Whiteley & Woolley (Leeds), and other gentlemen.

It is now definitely settled that there is to be a trades union congress held this year in Manchester. At the quarterly meeting of the local Trades Union Council, held in Salford, the chairman stated that in consideration of the profound ignorance in the public mind with reference to trade societies, and the probability which existed that legislation would be proposed shortly on the subject, it had been resolved to hold a congress in Manchester, to which it was expected most of the combinations would send delegates.

At Bradford the painters' strike still continues. The *Bradford Observer* says the employers observe that it seems to be implied that 5½d. per hour is the highest wages which journeyman painters receive, whereas many men who are on strike were already paid at the rate of 6d. per hour, and some men up to 8d. and 10d. per hour, according to ability; and such men, they say, are on strike for the purpose of compelling the masters to pay 6d. per hour to the lowest men. As regards the refusal of the employers to meet a deputation from the men, they state that the question at issue has been thoroughly discussed in all its bearings, and that further meetings on the subject could add nothing new.

A letter from Geneva, dated the 10th, says: "The strike has suddenly come to an end as if by enchantment. Every one read this morning a white poster, signed by M. Camperio, the head of the department of Justice and Police, announcing that the propositions of the employers and contractors had been accepted by the delegates of the different sections of journeymen, and that, in consequence, all the workshops would re-open on Monday, the 13th. The document, moreover, declared that the present crisis would leave no trace of misunderstanding, and that its cessation testified the spirit of conciliation which had always animated masters and men."

As to the recent disturbances in Belgium, according to the *Journal de Liége*, the judicial authorities have discovered the source of the distribution of money made by the leaders of the late strike at Charleroi. The funds are believed to have been furnished by the "International Association of Workmen," which had also lately influenced the workmen at Geneva.

RAILWAY INTELLIGENCE.

National Conference of Railway Shareholders.—A conference of the railway shareholders of the United Kingdom has been held at Manchester, in connexion with the Railway Shareholders' Association. The object of the meeting was for the reading of papers and discussion of a practical character, "with a view to influence beneficially the interests of railway proprietors, by aiding in effecting improvements in the railway administration and legislation of the country." The first paper was read by Mr. Wrigley, "On the importance of securing a more effective control over expenditure, with a special view to an accurate division of capital and revenue charges." Mr. Parkes read the second paper, which was entitled "On the desirableness of enactments restricting any outlay by directors on capital account until the requisite funds have been provided; and on the expediency of making inquiry before Parliamentary committees into the financial arrangements made by promoters of new railways."

Traffic Receipts.—The traffic receipts of railways in the United Kingdom amounted, for the week ending April 4, on 13,215 miles, to 715,740*l*., and for the corresponding week of last year, on 12,913 miles, to 701,531*l*., showing an increase of 302 miles and of 14,209*l*.

A STEAM ROAD ROLLER.

THE Town Council of Sheffield have recently purchased a steam roller from Messrs. Aveling & Porter, of London and Rochester, at a cost of 900*l*., delivered in London. The machine arrived in Sheffield last week. The roller was driven through the streets to the bottom end of Brammall-lane, from which point there is a new street called Ellin-street, which emerges on Sheffield Moor, near to the end of Ecclesall-road. There was formerly a reservoir on the site of part of this street, and in comparison with other streets in the town, the ground was soft and shifty. It was covered to the depth of about 10 in. with the loose stony material used in road-making, and before the ponderous machine was driven upon it was as rough and untraversable as it well could be. The Mayor and several members of the Council, chiefly members of the Highway Committee, went to the place where the test was to be made, and steam being up it was not long before the huge machine began to crunch along the new highway. The weight of the roller is 26 tons. When the machine had gone over the street two or three times it had transformed it from a rough, impassable thoroughfare to one almost as level and satisfactory,—of course not so smooth,—as an ordinary asphalted footpath.

We give a view of the roller. It consists of four wheels or rollers, the two front ones being 3 ft. 6 in. apart, and the hinder ones running close together, 6 ft. diameter and 2 ft. broad. The hinder wheels overlap the front ones 3 in. The total width covered by the roller is 7 ft. 6 in.

The whole machine weighs 25 tons, equally distributed over the rollers. The boiler is horizontal, and the working parts are on the top of the engine out of the way of the dirt of the road. The power is communicated to the rollers by an improved endless chain of great strength.

The two hinder rollers are fitted in a turntable, and become the steerage of the machine, which is perfect in its action. A boy twelve years old can steer the machine, and it can be completely turned in a road 30 ft. wide with great ease. We may add that the roller can be worked backwards or forwards. It is therefore seldom necessary to turn it.

A somewhat similar engine to this, but much heavier, is, we understand, working satisfactorily in the streets of Liverpool.

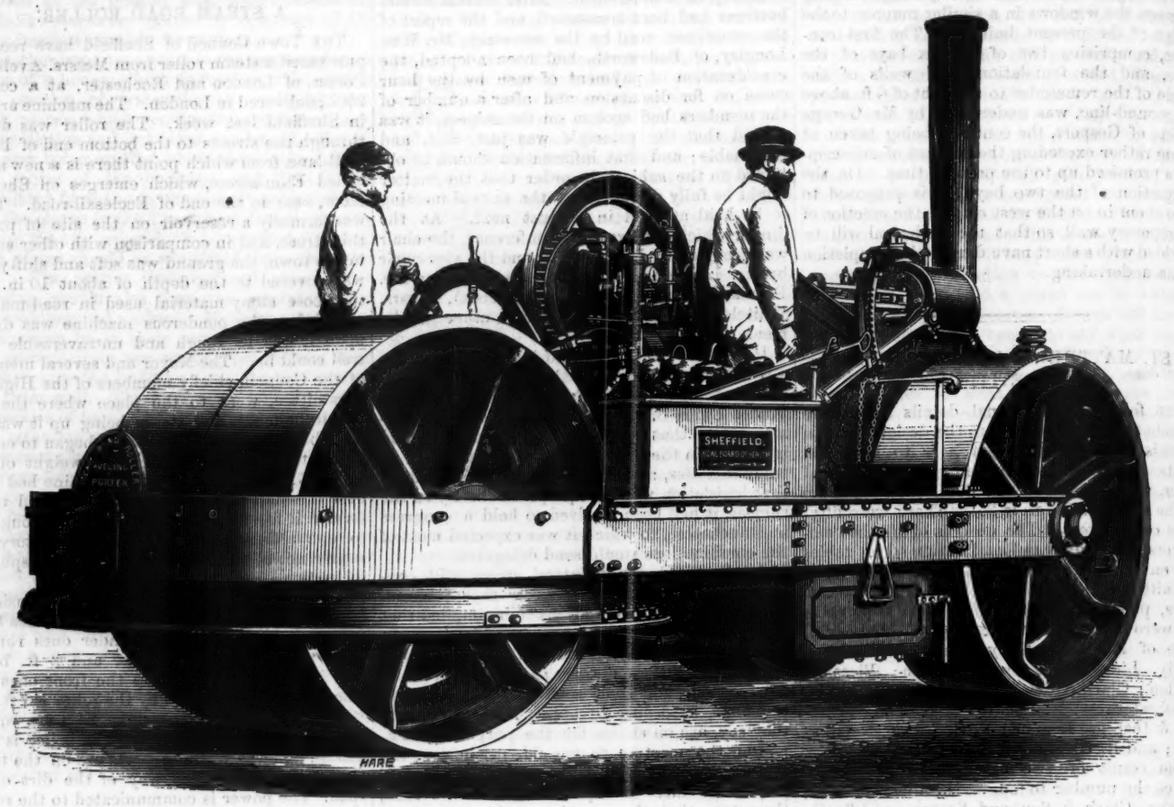
THE VICTOR EMANUEL GALLERY, MILAN.

THE completion of the Victor Emanuel Gallery is but the commencement of the work being carried out by the City of Milan Improvements Company, and consisting in the reconstruction and embellishment of the whole *quartier*, including the Piazza del Duomo to the Piazza della Scala, and in the construction of an entirely new street, which is called the Via Carlo Alberto.

The ceremony of laying the first stone was performed by his Majesty Victor Emanuel on the 4th of March, 1865, and the gallery was publicly opened by the king on the 15th of September, 1867, the time occupied in its construction being thirty months, during which time about a thousand workmen were daily employed.

The gallery consists of two passages, on each side of which is a handsome row of shops. These passages cross each other at right angles, and form a nave, 640 ft. in length, leading from the Piazza del Duomo to the Piazza della Scala; and a transept, 460 ft. in length, from the Via S. Raffaelle to the Via Silvio Pellico. The transept and nave are each 47 ft. 6 in. in width, and contain ninety-two shops. At their point of intersection an octagonal space, 118 ft. in diameter, is formed, which is surmounted by a dome rising to a height of 164 ft. above the level of the pavement. The shop-fronts are each glazed with a single sheet of plate-glass, and are separated by pilasters in the Ionic order, enriched at the level of the entresol and first-floor windows with panels containing ornamental designs in *bas-relief*.

Immediately above is an entablature in the Roccoco style which serves as a balcony for the second-floor windows, which are partly hid from view. A light and elegant balustrading, with a medallion bearing the arms of the principal cities in Italy in front of each window, completes the balcony. The third-floor windows are ornamented handsomely, and are separated by



A STEAM ROAD-ROLLER.

caryatides, which support an entablature at a height of 85 ft. 6 in. above the level of the pavement, serving as a base for the light curved iron ribs of the glass roof. This roof rises to a height of 104 ft. 9 in. above the pavement; above this is thrown a small roof, likewise glazed, at a height of 6 ft. above the other, so as to admit of ventilation.

The gallery is paved in the Venetian style, consisting of geometrical designs in coloured pieces of marble embedded in hard cement; and in the centre under the great dome are the arms of the House of Savoy, the city of Milan, and the Royal arms of Great Britain and Ireland in Mosaic, in the Byzantine style, by Dr. Salviati, of Venice. Below the pavement are cellars and subways for the water and gas pipes.

The dome consists of sixteen curved double-webbed ribs united at the top to circular casting forming an opening 32 ft. in diam.; these at intervals are cross-braced by horizontal segmental ribs, on which are laid the bars of T section to receive the glass. The circular opening at the top of the dome is protected from the weather by a conical glazed roof, the apex of which is 187 ft. above the ground. The sides of this lantern are left open for the purpose of ventilation.

Under the dome, in the spandrels formed by the intersection of the arched roof of the transept and nave, are eagles with extended wings, supporting alternately the arms of Milan and Savoy; and over the four corner shops are frescoes, 47 ft. 6 in. by 23 ft. 9 in., representing Europe, by Angelo Pietrasanto; Asia, by Giuliano; Africa, by Elenterio Pagliano; and America, by Casnedi. The frescoes over the archways at the entrance of the transept represent Agriculture, by Pagliano; Industry, by Pietrasanta; Sciences, by Giuliano; and the Arts, by Casnedi. At the height of the entresol are placed statues representing eminent persons of Italy, which add considerably to the general effect.

Entering the gallery from the Piazza del Duomo, the first statue on the left hand is that of Giovanni Battista Vico, by Amiconi; then Volta, by Magni; Lanzone da Corte, by Tabacchi; Giovanni da Procida, by Argenti; C. Beccaria, by a Crippa; Vincenzo Monti, by Manfredi; Ferruccio, by Pierotti; Michelangelo, by Magni; Dante, by Tabacchi; Galileo, by Magni; Raffaello, by Barzaghi; Girolamo Savonarola, by Boninsegna; Ug. Foscolo, by Rossi; Marco Polo, by Pagani; Macchiavelli, by Guarneri; Pier Capponi, by Magni; Romagnosi by Santardini; Beno dei Gozzadini, by Pandiani; Christofer Columbus, by the same sculptor; Galeazzo Visconti, by Corti; Vittor Pisani, by Calvi; Filiberto, by Romano; Cavour, by Magni; and Arnaldo di Brescia, by Seleroni.

The archways at the entrances from the Piazza del Duomo and the Piazza della Scala are 78 ft. 9 in. in height by 40 ft. in width. The entrances from the Via Silvio Pellico and San Raffaelle are 75 ft. 6 in. in height by 39 ft. in width.

The gallery is lighted by eleven sun-lights or chandeliers, and round the base of the dome by a ring of 300 gas-burners, and three rings of lights at the top, under the lantern; the total number of burners employed for the illumination being upwards of 2,600.

This work was designed and has been carried out by the architect to the company, Giuseppe Mengoni, to whom great credit is due.

It is not alone upon the creation of this really fine monument that the municipality of Milan is to be congratulated, since this forms but a fraction of the great scheme of improvement which has been organised for that Imperial city.

Our readers will, many of them, recollect the huddled buildings which crowded upon the splendid cathedral, and the narrow and tortuous alleys by which they could alone wend their way from the Piazza del Duomo to the vast, but not very beautiful, Theatre of La Scala. Already the Piazza is nearly cleared of the old buildings which disfigured it, and the Gallery itself provides a magnificent line of axis between the two great *foci* of attraction to all visitors to Milan.

The English company, by whom these improvements have been effected, have always looked upon the erection of the great Gallery as the least remunerative portion of that undertaking; but, already, they have succeeded in letting almost every shop and a large proportion of the apartments it contains.

The place wears the aspect of the greatest possible commercial activity, and it is difficult for any one visiting the gallery not to feel that for the purposes of trade, the rents must very speedily rule in the same proportion to those in other parts of Milan which the rents of the Palais Royal at Paris used to bear, in its palmiest days, when contrasted with those in the less popular streets of the same capital.

The next portion of the works with which the company will proceed, and for which the foundations are already brought up to the ground level, will consist of the extensive range of buildings which will form the southern side of the great Piazza del Duomo. The demolitions have already begun for the side of the same Piazza facing the west front of the cathedral, and a beautiful opening has been obtained to the very picturesque old Palazzo del Mercalanti, and the place surrounded with buildings which were famous as the head-quarters of banking and commerce, when the Lombard goldsmiths and bankers were the great financiers of Europe.

Our countryman, Mr. Digby Wyatt, who, as one of the directors of the company, has taken an active part in assisting Mr. Mengoni to the realisation of his great scheme, has been fortunate enough to receive an honourable recognition of his services, both from the King of Italy and the Academy of Fine Arts of Milan, having received from the former the Officer's Cross of the Order of St. Maurizio and Lazzaro, and from the latter a nomination as honorary Academician.

Mr. Charles Barry, it will be remembered, was employed professionally to test the financial organization of the scheme prior to the establishment of the company.

The unprecedented state of the money market has, no doubt, operated in retarding the full realization of Mr. Barry's prognostics; but no one acquainted with the great commercial importance of the city of Milan, and who has once seen the crowds who continually throng, and make purchases in the Gallery we illustrate, can doubt that, sooner or later, the tree the company have succeeded through so many difficulties in planting will bear a due amount of golden fruit.

THE VICTOR EMANUEL GALLERY, MILAN, ITALY.—SIGNOR MENGONI, ARCHITECT.

FROM IRELAND.

Dublin.—The statue of Burke, by Mr. Foley, R.A., has been erected on its already prepared pedestal.

The Vartry Waterworks.—The *Irish Times* says:—"The citizens will be glad to learn not only that the Vartry Waterworks are practically completed, but that financially they are in a much better position than they could have expected. The works have been in progress for nearly seven years, but at last the accounts are closed, and closed with a balance of 2,000*l.* in hand in favour of the citizens. The great reservoir has been rendered watertight, and the water is now within 11 ft. of the summit. A sum of about 12,000*l.* is yet to be expended in completing the suburban works, but from this source an income of between 5,000*l.* and 6,000*l.* a year is expected. The waterworks committee have unused powers to borrow to the extent of 75,000*l.* in case of necessity."

The Dublin Exhibition Building.—A meeting of the proprietors of the Dublin Exhibition Palace Company, presided over by Sir Benjamin Lee Guinness, M.P., has been held, for the purpose of taking into consideration the offer of the Government to purchase the building for 45,000*l.*—the sum at which it had been valued by Colonel M'Kerlie and Mr. Ward Hunt. The directors had offered to sell the entire of the company's property (including buildings, grounds, engines, machinery, organ, &c.) to the Government for 60,000*l.*; but the proposition would not be entertained. A very strong opinion was expressed at the meeting against disposing of the building at so great a sacrifice as 45,000*l.*, which would not be sufficient to cover the liabilities of the company. Several influential shareholders thought that another effort ought to be made to resuscitate the undertaking, by raising money by the issue of preference shares, thereby preserving the palace and grounds for the purposes for which they were originally intended. Finally, a committee was appointed to consider how this object could be best effected.

FROM SCOTLAND.

Newhaven (near Edinburgh).—The Society of Free Fishermen at Newhaven have just completed the erection of a tenement of dwelling-houses, says the *Scotsman*, in a manner highly creditable to them. The tenement is situated in Fountain-place, opposite the stone pier. The building contains six dwelling-houses, each consisting of room, kitchen, light bed-closet, and scullery, with water-closet for each flat. In addition to the range of dwelling-houses, the fishermen have erected a public clock, with an illuminated dial, 36 in. in diameter, placed in a pediment in front of the building. The clock will be illuminated all night for the accommodation of the fishermen leaving and entering the harbour.

Kirkaldy.—A commencement has been made with the execution of the Kirkaldy and Dysart water-works, which are to supply one million gallons of water per day to the two towns, being at the rate of fifty gallons daily to each inhabitant. It is hoped that within a year the Lothrie water will be brought into and distributed over the burghs of Kirkaldy and Dysart. The supply is said to be abundant, even for a great increase of population; and the quality is also very fine. According to the report of Professor Penny, of Glasgow, there are only 7 grains of dissolved ingredients in the gallon, of which 1·66 grain is organic matter, and the hardness is 3½°.

Ayr.—The improvements on the north side of the harbour are approaching completion. These works have been executed by the Glasgow and South-Western Railway Company, who intend to ship coals at the new quay. The new quay wall in course of erection, by Mr. Stewart, is in a forward state. By other improvements the harbour has been widened from 30 ft. to 50 ft. The Harbour Trustees have accepted an offer from the Messrs. Hunter, Edinburgh, who have contracted to execute the necessary work on the pier and breakwater at a cost of upwards of 4,000*l.*

Cottage Accommodation in Scotland. — Mr. M'Lagan, M.P., and Mr. Thomas Graham Murray, W.S., having recently been in communication with the Enclosure Commissioners in reference to the commissioners' requirements for cottages erected on estates in Scotland under their sanction, a letter, addressed to Mr. M'Lagan, has been received from the commissioners, in which they state that as the cost of four-roomed cottages has operated as a restriction on improved cottage building, every facility shall be given to extend the practice, which already has in many cases been adopted, of sanctioning cottages composed of three rooms, to be charged on the estate. In such cases it is recommended that the living-room should not be of a less size than 16 ft. by 18 ft., and 10 ft. in height, but in no case should the size be less than 12 ft. by 15 ft., nor the height less than 8 ft.—they think 9 ft. preferable. They are further of opinion that the method of structure which encourages the practice of having recesses in which box-beds are placed, should be avoided. A scullery or wash-up place, as well as the usual out-offices, they add, should of course be also provided.

ANCIENT CRUCIFORM PLATFORMS.

WE hear of the discovery, near the village of Swinton, North Riding, and close to the old Roman road from Eboracum to Prætorium, of a cruciform excavation 8 ft. 9 in. in depth, cut into the solid rock. The arms of this cross were to the cardinal points, were exactly of a length, measuring from north to south and from east to west 19 ft., being 6 ft. wide at the point of junction, and 5 ft. at the ends. The sides were perpendicular, and the bottom was a flat surface of coralline oolite. Upon this level bottom of the excavation was raised a platform, also in the form of a cross, the arms of which extended the whole length (nearly) of the cutting, and were 2 ft. in height and 2 ft. wide. At the point of intersection was a large square block of calcareous freestone, and the whole of the platform was made of the same rock, in large blocks at the bottom and smaller stones upwards, all carefully placed. The excavation was filled up with soil, containing Roman pottery, beds of clay and charcoal, quantities of Mediæval pottery, a worked bone pin, &c. A very similar structure, but formed on the natural ground, with a mound over it, was found at Helperthorpe, on the Wolds, about eighteen months ago. The cruciform foundation in the area of Richborough Castle, Kent, will be remembered on reading this notice.

SURVEYOR TO THE HON. SOCIETY OF GRAY'S INN.

THE regretted death of Mr. Francis Wigg, the late surveyor to the Hon. Society of Gray's Inn, has left a vacancy, which does not appear to be generally known to the profession. He was appointed to the office on the 22nd of May, 1833, and he held it until his death, on the 26th day of February last. It is rather curious that his immediate predecessor was appointed to the office in the year 1800, so that they each held the office for nearly equal periods.

Upon the death of Mr. Wigg being reported to the benchers of the society, they declined, we have been informed, to fill up the office immediately, thinking that the vacancy might not be generally known amongst the profession, and that sufficient time had not been afforded to gentlemen to compete for the appointment.

OPENING OF THE NEW WORKHOUSE FOR WEST DERBY UNION, LIVERPOOL.

THE new workhouse at Walton, the first stone of which was laid on the 29th of March, 1864, by Mr. Thomas Haigh (the then chairman of the West Derby Board of Guardians), has been formally opened. The edifice has been constructed to accommodate 1,000 inmates, and has cost, including the price of the land (purchased from Lord Sefton), 65,000*l.* The grounds extend over an area of 37 acres, and it is intended to devote a great portion of the land to cultivation, so as to afford useful employment for the inmates. At either end of the building are hospitals for male and female inmates, and it is intended immediately to proceed with the laying out of a cemetery and the erection of a church. The main building is already nearly full; and it is probable that in course of time the accommodation will not be too much for the numerous poor chargeable to the rates of the West Derby Union. Messrs. Culshaw & Sumners are the architects, and Mr. James Walters, the builder.

SCIENTIFIC LECTURES FOR THE PEOPLE.

A SERIES of lectures, in connexion with Mr. Twining's Economic Museum at Twickenham, for the instruction of the poorer working classes in the principles of elementary science, and its applications to health and the requirements of every-day life, has been in course of delivery in various parts of London during the autumn and winter, the last for the season having been given at the Mayfair Literary Institute, Hertford-street, Mayfair. The course consisted of eight lectures. Mr. Twining prepared his lectures in clear and simple language, taking care to define and illustrate every technical term, however common it might be, before using it. The illustrations, consisting of diagrams, specimens, models, and experiments, were all likewise of the simplest kind. The lectures were provided gratuitously in all respects by Mr. Twining, and have been delivered two or three times every week (holiday times excepted), to audiences varying from 100 to 200 up to about 1,000 persons, at school-rooms, literary institutions, workmen's clubs, mission-rooms, and at the Lambeth Baths. They have been read by Mr. W. Freeman, curator of the Twickenham Economic Museum, the experiments being performed and the illustrations exhibited by Mr. George Whipple, of the Royal Kew Observatory. This attempt to bring elementary science within the reach of the poorest and most uninstructed will be highly appreciated by all sanitary reformers, who find their greatest obstacle in dealing with the poor themselves to be their complete ignorance of the laws of science and health.

THE NUT FOR THE PROFESSION TO CRACK.

PAYMENT OF ARCHITECTS.

SIR,—The nut that "a country gentleman" gives "the profession" has surely been cracked by every professor his own way, and I cannot see what "convention" or "system too strong for individuals to break through" can possibly have to do with it. If ten "architects" or "engineers," or a thousand, whether forming an "Institute" or not, have each elected to be employed in the way he calls "unreasonable," it is simply that to each of these ten or thousand reasoners this appeared *reasonable*,—nay, the highest reason (to quote your other correspondent), "*the best that could be devised* under the circumstances." Others, as myself, to whom it never appeared reasonable at all for one instant of course never adopted it, but whatever appeared the best each of *us* could devise. Now, is not "*devising*" the architect's and the engineer's whole specialty? What is meant, then, by "convention beats them down" in this very first matter of devising? Has the professional deviser not devised the very first thing he had to devise?—how to reckon his own pay? Of course he has. The architect, the engineer, has devised, and this is his device! If it be not to your taste, or sense of the "reasonable," observe this is his *architecture*,—this is his *engineering*. Take it or leave it. What do you want either "profession" for, but for their *devising?*

If the "Country Gentleman" had been a "constant reader" any considerable time, he would know that his "Nut" is a very old acquaintance in the *Builder's* pages. I have noted the following times of its special appearances:—

1845 ... No. 150, p. 605 (Leader).
1852 Nos. 469-72, pp. 76, 91, 122.
1857 ... No. 748, p. 320.
1865 ... No. 1185, p. 752.
" ... No. 1187, p. 787.
" ... No. 1188, p. 798.
" ... No. 1189, p. 821.
" ... No. 1190, p. 829 (2 letters).
" ... No. 1192, p. 876.
" ... No. 1193, p. 894.
" ... No. 1194, p. 913.

Your correspondent would find the "professional" mind very satisfactorily displaying itself, I think, in No. 1187 (letter signed "Thomas Harris"), No. 1192 ("E. L. Tarbuck"), and an answer to the latter in No. 1194.

What I presume "A Country Gentleman" and *his* public (as distinguished from the Institute's public) really want, is an alphabetical list occasionally advertised, like the annual list of "sworn brokers," of those who are declared or sworn *owners' architects*, as distinct from *contractors' architects*, being headed by some such declaration as this:—

"We, the undersigned, practising as owners' engineers, or owners' architects, building designers, or building surveyors, do hereby declare,—

1. That for no service on any building are we employed or paid, or will be so, by any but the owner or occupier of the same.

2. That we are not in partnership with any builder or other tradesman, or will be so.

3. That we have never received per centage on the cost of any work, nor will receive any."

As one of the latter of the four classes for whom the *Builder* is intended, I must say the really difficult and sole "nut" I find to crack, and which I consider a real hardship and grievance, is that one cannot practise in this country the useful and necessary art of building-design without being confounded popularly, and by writers like "A Country Gentleman," with the order of men that, of all others, from the palace to the gaol, I most object to be classed with, the producers of your public buildings (things called "works of art"), in a word, professors of *Percentage-Art*,—a style, not the smallest fragment of which, be assured, will ever be mistaken for aught else as long as a stone of it can be dug up. But whether one calls oneself architect, engineer, builder, or mere surveyor, it is all the same. Each now is taken to mean what I abominate beyond all trades, penal or not.

AN ARTIST, NO PERCENTAGER.

DAMP.

IN reply to your correspondent "G. D. B.," in your publication of February last, I would recommend his trying, on a small scale, "bright American varnish," laid on with a brush like paint. It should be kept warm during the process, so as to retain the consistency of paint.

A few days' delay in painting over the varnish will be sufficient, and a dry day should be selected. The cost per gallon of the bright American varnish is about 4*s.* outside. I shall be glad to know the result if "G. D. B." will forward it.

The "bright American varnish" may be procured at most sea-ports. F. R.

STORAGE OF RAIN-WATER.

RECENTLY Mr. Bailey Denton has drawn attention to the storage of water. He tells us that we may expect a dry summer, and therefore it is well to look for economy in the use, and the careful preservation, of the supplies. He points attention to storage reservoirs, but I think there is another part of the subject which deserves more attention than it has received, and that is the preservation of rain-water for domestic use, by having a cistern specially to receive the roof-water.*

When I rebuilt my house, I put up a large cistern capable of holding 1,000 gallons, and it has been one of the greatest luxuries we have enjoyed ever since. The whole of the roof-water goes into it, and the overflow is connected with the rain-water pipe, which empties itself in the usual way. The cistern is carefully covered, so that the blacks are kept out, and the water is not more discoloured than I have seen water taken from streams in healthy districts. We use it for the bed-rooms, and other purposes of a like nature, but not for culinary or drinking purposes. Although mine is a large house, we have only once been without this water for four years. It might be made much clearer by a simple system of filtration, but I have never found it necessary to adopt this precaution, as we have become quite reconciled to its appearance, from the much greater softness it possesses than the water supplied by the company. To say nothing of the greater ease, comfort, and effectiveness with which the process of washing is performed, I am sure that I save the interest of my outlay in soap.

At this time all such measures are important. Quite apart from all consideration as to the saving of water it is of moment, but it is now understood that the report of the commission on the London water supply will be in substance against the large schemes for supplying London which have been proposed to us, but will strongly recommend a constant supply. It will, therefore, be necessary that the public as well as the company, should look carefully at the question so as to check waste, and to economise the use of water. The erection of a rain-water tank in every house would greatly conduce to this end, while it would tend to promote cleanliness and health. S. S.

* We have specially urged this on more occasions than one.—ED.

HORNCASTLE TOWN SEWERAGE TENDERS.

WE have received the following list of preposterous tenders sent in for sewering Horncastle. The quantities were supplied, so that the differences are in price only:—

Barstow & Co.	£6,388	0	0
Speight & Sons	5,751	0	0
Morton & Sons	5,509	0	0
Monloon & Co.	5,129	0	0
Binns	4,600	0	0
Abell & Co.	4,534	0	0
Moore	4,159	0	0
Beard	4,102	0	0
Preery	4,074	0	0
Wainwright	3,812	0	0
Williams	3,722	0	0
Walter	3,710	0	0
Finsley	3,677	0	0
Barry	3,571	0	0
Finson & Fast	3,500	0	0
Hadsforth & Coury	3,348	0	0
Young	3,288	0	0
Edwards	3,249	0	0
Ford	3,229	0	0
Potter	3,165	0	0
Frow	2,892	0	0

"After the tenders had been opened and their sums made known, Mr. Young (3,288*l.*) pleaded an error, and was, in consequence, allowed to make a private proposal of 2,977*l.*, which, being 15*l.* below the lowest, the Board, with the Rev. W. H. Milner, vicar, in the chair, accepted the new proposal or amended tender, to the discredit of the four contractors originally lower."

We give this statement as sent to us by more than one of the persons who tendered.

FOOTINGS ON ANOTHER MAN'S LAND.

A CORRESPONDENT, signing "Stylus," is very facetious as to "Surveyor," who asked a question, a few weeks back, concerning the right, or otherwise, of allowing the projection of his footings on the adjoining ground:—

"You can no more build," says "Stylus," "under another man's land than you can upon it, and the reasons are quite plain, and, if I may add, natural."

"In all buildings the walls, and the earth upon which they stand, are one and indivisible. In the case of leasehold land and freehold house, the person building the house hires the land upon which it stands for a given term, at a yearly sum, which is called ground-rent. When the ground-rent fails, or the lease expires, the house then merges into the ownership of the soil.

This has been the law of England for more centuries than we need care to go back to. If a man chooses to widen the base of his building surreptitiously, so as to touch, or rest on, or under, another man's land, then that other man, upon discovery, can call in the force of the law and have that portion of the building removed."

"Stylus" is evidently not aware that Building Acts which are or have been in force, have at times given this special right to builders. The Metropolitan Building Act of a few years ago did so. "Surveyor," however, must consider that, where there is no special Act in force, he cannot touch or encroach upon the soil of his neighbour.

HUSBANDRY IN HYDE PARK.

SIR,—Would it not be well that Londoners should be informed that in Hyde Park the rural scenes for the year have already commenced?

The other day, standing on the rising ground north of the barracks (in the centre) I was surprised at the truly rural scene before me. Looking in the direction of the bridge, scarcely a sign of London is to be seen, and, to enhance the view, an acre or more of grass had been removed, leaving the ground bare, and over which a fine horse was drawing a harrow, giving one the idea of a field under cultivation; men at work cutting sods, carts slowly moving to and fro to carry them away and bring earthy material to take the place of the green heritage removed, each cart making evident its progress and the route it had taken by the long depressions left in the sward, in some places two or three inches deep. It was, indeed, a truly rural scene; it required no stretch of imagination to believe oneself miles in the country. I say "it was," but it will be continued, sir, after these holiday times are over, if we may judge by the last two seasons, when on each occasion some three or four acres of the most beautiful grass in this park were removed as sods, and as yet this year they have cut but about one acre. And if Londoners very much approve of husbandry being thus carried on in Hyde Park, the authorities might, perhaps, this season be induced to continue it till all the grass be removed, and then we might be favoured, perhaps, with a ploughing match, as an accompaniment to the Cattle Show at Christmas. Is it not kind and thoughtful thus to bring these rural scenes into the heart of London; and at the same time, you know, it saves purchasing sods elsewhere?

Unfortunately, going on a little further one comes to that drawback to the pleasure of a stroll over a farm, viz., the dung-heap, or, as it here must be termed the rubbish-heap. I regret to say I cannot admire their choice in placing it in the very centre of the Park, at the side of a copse of trees (late the betting-ring). This would be one of the prettiest parts of the Park if it were but clean and sweet. Here, from time to time, one may see mud-carts toiling over the sward to add to the heaps their load of road-scrapings and coarse rubbish. Here it remains till wanted, being occasionally turned over to facilitate decay, and which I am sure it does, by the smell then given off.

Last year much of this (without sifting) was spread over the Park, and its contents might have furnished startling points to some Hervey for volumes of "Meditations." It seemed to contain remnants of everything in civilised society;—old shoes, rags, saucepans, sardine-boxes, broken canisters, plates, dishes, wires of umbrellas, brickbats, broken bottles and glass, the sharp points of which sparkled on the ground amidst the relics of almost every conceivable thing, and which were allowed thus to remain for many weeks, if not months, to be moralised on.

R. F. C.

DEATH IN THE ALLEY.

SIR,—The *Builder* has done much to enlist sympathy in behalf of the poor creatures living (or rather dying) up narrow courts, dismal purlieus, and back slums, in towns. Let me appeal to those who have the power and the will to aid in this work of mercy, for it is imperative we ought to obtain the width and whereabout of every fever-den in the kingdom. Subsequently to an Act to be passed, all such places under 2 ft. wide in any part thereof should be closed as human dwelling-places the first year, under 3 ft. the second year, under 4 ft. the third year, and so on up to 12 ft.; the *minimum* to be allowed by law. I have had plenty of sympathetic (pie-crust) promises from Members, but no good has resulted yet. R. T.

CHURCH BELLS.

SIR,—In a late number of your interesting journal there is an account of the building of a church at the north of London, in the neighbourhood of Somers-town. Now, sir, it is a remarkable fact that there is not one church-steeple in the parish of Saint Pancras that contains a peal of bells, or in fact any part of the north of London, with the exception of the parish church, Islington. This church in Somers-town is building, I read, by the munificence of a gentleman, and a peal of bells would no doubt be a novelty to the inhabitants of the neighbourhood of the church. AN INHABITANT.

EFFLORESCENCE ON BRICKWORK.

SIR,—All exposed brickwork in these parts (Swansea) becomes, after a short time, covered with a white powder or efflorescence, which renders any attempt to produce coloured patterns in that material quite futile. As constant subscribers to your valuable journal, we beg to say that we should be greatly obliged if you or any of your readers would inform us of any means by which such disfigurement can be prevented, or effectually and permanently removed. T. W. & J.

A SURVEYOR'S CLAIM AGAINST A LOCAL BOARD.

IN the case of Shufflebotham *v.* The Widnes Local Board of Health, the plaintiff, who had been surveyor to the Board, claimed 37*l.* 10*s.* for salary due on his dismissal within the period of his previous notice of resignation. In consequence of disagreement with certain members of the Board, who seem to have had the appointment of an engineer-in-chief in view, the surveyor gave notice of his resignation in three months, and in the meantime performed his duties as usual, but had not attended two meetings of the Board, which were not included in his duties, but which he had been in the habit of doing. In a letter to the clerk, he had explained that in the one case he was unwell, and in the other, the Board were to discuss the appointment of his successor. The Board dismissed the surveyor within a month or so of the expiry of his notice of resignation, offering him his salary up to the time of dismissal, which he refused. The defence was rather a shuffling one. It was argued that by the Act appointing local Boards, the Board had "a power of summary dismissal of which they could not deprive themselves;" to which the County Court judge, before whom the case stood, replied that he "must disagree with that: what must become of any local Board if their most confidential officers could go and leave them at any moment?" The Legislature, he remarked, could not have contemplated such an absurdity, or, as was also urged, that the Board could not do anything "which might work to the injury of the ratepayers, and the embarrassment of a subsequent Board." It was admitted, nevertheless, that a contract had been made with the surveyor which had not expired at the time of dismissal; and the idea seems to have been that the contract was binding upon the surveyor, but not upon the Board!

As the Judge was obviously against the defendants on these points, neglect of duty was next urged; but it was shown that attendance at the Board's meetings was not a duty of the surveyor, and that calling such meetings, which the surveyor had goodnaturedly done, was a duty of the clerk to the Board. The defendants' counsel then consulted with the plaintiff's, and agreed to a verdict for the 37*l.* 10*s.* claimed. The Judge seemed to be of opinion that more might have been claimed; for he said, "If the plaintiff gave three months' notice, and you wrongfully dismissed him when a month had yet to expire, he could still claim the whole amount, even from the moment of his discharge." There was also a claim for special damage, which could not be entered into, as notice to that effect had not been given. On the whole, the Widnes Local

Board did not come out of the affair with credit to themselves, and they established no charge against the plaintiff. Indeed, that he was an efficient officer was declared in evidence by one of the Board themselves; and the Judge said at the close of the case, that "the plaintiff had been able to relieve his character from an imputation, and make himself stand properly before the public as a respectable person entitled to the fullest trust."

The plaintiff, we understand, had given up the surveyorship of Crewe, with a good private practice, to undertake the surveyorship of Widnes, and had done some heavy work at Widnes for the Board over and above his ordinary duties.

THE DUKE OF BUCCLEUCH v. THE METROPOLITAN BOARD OF WORKS

This action has been again before the judges in the Court of Exchequer.

Mr. Pollock awarded to the duke a sum of 8,325*l.* The jury found a verdict not only for that amount, but for interest upon it, and for the expenses of the award. Mr. Hawkins, Q.C., contended that, if it should turn out that the umpire had awarded any sum, however small, which he had no jurisdiction to give, the award was bad, and the defendants would be entitled to the verdict. Mr. Hawkins submitted that there was no grant of the jetty to the duke under either of the leases, that the jetty was really public property, and that, therefore, he was not entitled to compensation in respect of it.

Mr. Baron Martin said it appeared that the jetty had existed from the time of Charles II. He did not know whether Sir Walter Scott could be considered an authority upon such a matter, but he spoke in one of his novels of stairs from Montagu House to the Thames

Mr. Hawkins wished he could avail himself of such an authority, as the process would be both instructive and amusing.

Mr. Baron Martin said there could be no doubt the stairs belonged to the Old Palace of Whitehall, and the Crown could make a grant of them to any one.

The Lord Chief Baron said, as at present advised, I am of opinion there was abundant evidence to prove that the jetty was an easement and right of way belonging to Montagu House, and that it passed by the general words in the lease to the duke, who is consequently entitled to compensation for the loss of it.

Mr. Hawkins then argued at some length that in regard to various other matters for which the umpire had allowed certain sums the plaintiff was not entitled to compensation.

The court granted a rule generally: rule *nisi*.

THE LIABILITIES OF ARCHITECTS.

SWATRIDGE v. COLSON.

This was an important case to professional men heard in Sherborne. The plaintiff, a marble mason, of Yeovil, sought to recover 16*l.* 13*s.* 8*d.*, for two stone chimney-pieces. Mr. Watts appeared for the plaintiff: the defendant, an architect, of Sherborne, conducted his own case. The defendant had been engaged in erecting a rectory at Sandford, and, in accordance with his instructions, the plaintiff made two stone chimney-pieces, which were fixed there, and he now sued for their value. His Honour asked if the defendant undertook to pay the plaintiff.—Mr. Watts: He gave the order.—His Honour: So they are generally given by architects, and tradesmen are very much obliged to them; but the principal pays.—Mr. Watts said the principal was not disclosed.—His Honour: If the principal was not disclosed, and a person gave an order, and there was fraud, then he would have to pay; but in this case it seemed the order was given simply in the capacity of architect.—Plaintiff said he had always considered Mr. Colson the responsible party, and had entered the charges for the work done to him in his account-books.—His Honour said application must be made to the person who was liable.—Mr. Colson: He has become bankrupt, or you would never have heard of it.—Mr. Watts: Exactly; that's just what we say. Mr. Colson cannot get his money, so he disputes his liability.—The plaintiff then stated his case, and said that he had never known the principal. The order had been given by Mr. Colson, who had looked at the books, and pointed out what items were to be charged to him and what to the builder.—On the other hand, the defendant, on being sworn, said he was an architect, and resided at Sherborne. Swatridge called at his office several times early in 1867, requesting that he might supply some of the chimney-pieces at the rectory. He told him that he was in communication with a marble company, and showed him a book of designs, with list of prices, and a letter offering 15 per cent. commission on orders.

His Honour: Is that usual? I don't ask whether it is usual for architects to accept what they can get, but is it usual for companies to do that?

Witness: I don't think it is usual, but in this case it was done; however, I did not accept it.

Mr. Colson continued: Swatridge said he could not supply chimney-pieces at so low a price, and voluntarily offered me 5 per cent. commission. I told plaintiff on one occasion the nominee of the Queen Anne's bounty—the Rector, the Rev. Urquhart Cookworthy, was the owner, and the contractor Mr. Gale, then living at Portland. Plaintiff inquired what I knew of Gale as to his means and responsibility, and I read him letters from Gale's references, and told him that Mr. John Trask and Mr. David Jeanes, of Stoke, were his sureties. On the 3rd of May, having obtained the consent of the contractor that Mr. Swatridge should be employed, I delivered plaintiff tracings of my designs, from which the chimney-pieces were executed and erected, under my instruction. In November last I requested Mr. Swatridge to supply me with a memorandum of the cost, and other items, to enable me to measure for and to make out my bill of extras. I left him the memorandum, which he has produced, and he sent me an account. I made out the bill of extras in the usual manner, allowing the contractor the amount of 6*l.* 13*s.* 2*d.* for the extra value of chimney-pieces, beyond the amounts named in the specification. The plaintiff has seen that bill of extras; and in December last the nominee attended, and settled the balance due to the contractor, and tradesmen who had also been employed under my instructions, attended, and were paid the accounts by Mr. Gale. Most likely if Mr. Swatridge had attended the settlement, he would also have been paid, as Gale received a very considerable balance.

Plaintiff: But you promised to write to me and say when payment was to be made.

His Honour: That shows where you expected to get your money.

Defendant said he had witnesses to call who had been similarly employed by him.

His Honour, however, did not think that necessary, and in delivering his judgment said there was no doubt that Gale was the contractor for the works. It was one of those unfortunate cases in which the person really liable had become insolvent. It must be very strong evidence that would make him believe that the case was one out of the ordinary run of business by which an architect made himself personally liable instead of merely giving directions. They had been told that before the work was done the plaintiff was informed of the name of the rector and the contractor, and that he offered 5 per cent. on any commissions defendant could obtain for him. If that was so it was conclusive, and it had not been contradicted; and it seemed that the plaintiff had also inquired as to the means of Gale, in reply to which the defendant had read several letters as to his character, and had informed him of his sureties. All that was perfectly inconsistent with the supposition that he looked upon the defendant as making himself personally liable, and nothing having been made out to his satisfaction that the verdict should be against the defendant, he should give it for him, with his personal expenses.

THE COST OF IMPROVING PARIS.

The reports of the tribunals which have adjudicated the sums received by tradesmen for leaving their places of business just now in the Rue de la Paix and its immediate vicinity facing the new Opera House, say:—

"The expropriations for the opening of the new street, the Rue Réaumur, are actively going on. The jury who estimate the sums to be paid for this relinquished property are now engaged upon the section between the Rue du Port Mahon and the Rue de Choiseul. Three of these purchases alone have cost each of them more than a million of francs. [The reader will bear in mind that a million of francs is 40,000*l.*, and 100,000*f.* 4,000*l.*] For the house No. 29, in Rue Augustin, 1,200,000*f.* have been paid; for No. 7, Rue de Grammont, 1,025,000*f.*; for No. 3, Rue de Choiseul, 1,800,000*f.* In one house alone in the Rue Neuve St. Augustin the indemnity paid for loss of trade exceeded half a million; a florist obtained 240,000*f.* for an unexpired term of his lease of six years; a dealer in lace, 160,000*f.*; and the Restaurateur Bignon, whose cellars were in Rue de la Michodière, No. 8, received 300,000*f.* A question presented itself as to the claims of the Artistic Union Club, established in the Rue de Choiseul, the question being, whether the members of a club constituted a tion being, whether the members of a club constituted a society properly so called, and whether they could claim as such? The question has been determined in their favour, M. De Barthélemy, who appeared for the club, having obtained 300,000*f.* The total purchases made in the present series of awards exceeds 15,000,000*f.* The jury has since proceeded to seven other awards for buildings required to be taken down in pursuance of the improvements everywhere going on in the city of Paris. In the Rue Louis le Grand, No. 33, the proprietor demanded 1,000,000*f.* for his interest, and was paid 900,000*f.* In the case of the proprietor of No. 30, Rue de la Paix, he demanded 1,540,000*f.*, and obtained 1,320,000*f.*; one of the shops belonging to this house is occupied by Madame Lucy Hoquet, a modiste, and to whom has been awarded 300,000*f.*; 100,000*f.* to a glover, and 230,000*f.* to a jeweller in the same house. The total amount of indemnities paid for seven other houses reaches 10,800,000*f.*; for five others the sum amounts to 7,000,000*f.* The gross total is somewhere about 26,000,000*f.*, or 1,040,000*l.* For the short cut from the Rue Louis le Grand to the angle of the boulevard the indemnities amount to 60,000,000*f.* The figures here given, it will be understood, are sums paid for expropriation and to the landlords. After this expenditure the new houses have to be built.

SANITARY MATTERS.

Surveyor's Reports on Newcastle-upon-Tyne.—Reports by Mr. Bryson for 1865-6-7, have been printed by order of the Newcastle Town Improvement Committee, showing the progress made during the last three years in sewerage and drainage, street improvement, &c. On the subject of the public health of the borough, the surveyor says:—

"It is a matter of serious concern that, notwithstanding the strenuous efforts made by the committee to improve the sanitary condition of the borough, a high rate of mortality still prevails.

In connexion with those questions, underlying that of public health, which come within the range of my department, I may remark that, although a great deal has been done in the way of sewerage and house drainage, still much remains to be done in the ventilation of sewers, and in the paving and surface drainage of the extended parts of the town, especially in the neighbourhood of Scotswood-road and other places.

While, however, these improvements are all good as far as they go, still it is my conviction that, until better accommodation be provided for the working classes, the death-rate will not be very materially reduced. So long as the old houses in the overcrowded parts of the town are permitted to remain above ground, they will find inmates; and I would take the liberty of suggesting that, if some of those schemes of street improvement through Pandon and the lower parts of the town were carried out, they would be of immense service in this direction, and, in addition to opening out sites for such a purpose, would afford great relief to the commerce of the quay.

Another and most important problem which has yet to be solved relates to the disposal of the town sewage. At present it is, as you are aware, by the system of water-closets and sewers now in use, discharged into the river,—a system which is a great improvement upon the former objectionable use of cesspools; but, looking at the matter in an economical point of view, a great inconsistency is observed: while, on the one hand, we send thousands of miles, at a great cost, for the excreta called guano; on the other, we not only throw away that we already possess, but render it worse than useless by converting it into an element of disease. But, whatever might be the benefit in pecuniary result of utilising the sewage, the benefit of ridding the town of it is an advantage in point of health beyond money value."

CHURCH-BUILDING NEWS.

Brooklands (Manchester).—The church of St. John the Divine, at Brooklands, built and endowed at the cost of the late Mr. Sam Brooks, has been formally consecrated by the Bishop of Chester. The building, which was commenced in 1864, has only just been completed. It is situated on the west side of the road running through the Brooklands estate, due south from the South Junction Railway. The church is in style Gothic, and as evidenced by its most distinctive feature, such as sections of mouldings, proportions of arches, and carving, of a simple type, belonging, perhaps, to the earlier period of French work, rather than to that of England. The materials of which it is built are, externally, Yorkshire shoddies of a warm tint, with dressed work of Halifax stone; whilst, internally, the walls are lined with fire-bricks, cream and brown, in bands and diaper-work. The plan is a nave of six bays, 90 ft. long by 33 ft. wide, without clearstory, roofed in one span, having transepts north and south, taking up the two easternmost bays, divided from the nave by arcades of two arches. The extreme width across the nave is 68 ft. Reached by a broad flight of steps are a choir and chancel, 32 ft. long by 20 ft. wide, with organ-chamber to the south, and on the north a small door leading to the sacristy. The building is entered at three doorways,—one in the west front, a porch on the north-west, and a porch at the angle of the sacristy and north-west transept. The chief façades of the building are the west and east. Right and left of the canopied western doorway the wall-space is broken up with a simple arcade, above which, and occupying nearly the whole of the gable, rises an arch, filled in with a pair of three-light windows, with traceried heads of three plain circles, a piece subdivided by geometrical iron glazing grilles. The sill of these windows is kept up a considerable height from the ground, and between it and the sub-sill of the main arch, under which the windows are grouped, are two large circular medallions, one on either hand of the door canopy, filled with highly relieved sculpture. The subjects are the Call of St. John from his fishing-net "to become a "fisher of men," and his writing of "the things he saw in the isle called Patmos." At the east is a rose window, of seven circles: all but the centre are cusped cinquefoil. Below the window is an arched panel, containing, in relief, the evangelical symbol, the eagle. The reredos, painted in wax-colour, covers a space of 18 ft. wide by 5 ft. 6 in. high; it is divided into three compartments, the central subject being our Lord in Glory, with, on either hand, angels in postures of adoration, and at the four corners of the central panel are cherubs. The background of the work is filled in with plants of wheat and vine conventionally treated. Above the reredos, in the spandrels below the rose window, are two medallions, filled with Caen stone heads of the Virgin Mary and St. John, with gilded aureoles. The choir and chancel-floor and walls, to a height of 4 ft. 6 in., are laid with encaustic tiles. The whole of the windows are glazed with two tints of green glass, with the geometric forms in tracery picked out with touches of brilliant colour. The church is at present towerless, having but a slight beaded wood bell-flèche rising from the nave-ridge, and supported by the roof-trusses. The building is arranged to accommodate at least 500 people, and a large proportion of the seats are free.

Gloucester.—St. Catherine's new Church has been consecrated. The edifice consists of nave, transepts, and chancel, with circular apse. The nave is 68 ft. long and 28 ft. wide; the transepts are each 20 ft. by 13 ft.; and the chancel 22 ft. by 22 feet. There is a vestry on the north side and an organ-chamber on the south side of the chancel. The church is of Early French character. The chancel is lighted by five windows; the transepts by three lancet windows with trefoil heads, and a pierced Catherine-wheel window of seven lights, with plate tracery; the west end by two double-lancet windows, and a

Catherine-wheel window of nine lights, with plate tracery. There are also double-lancet windows on each side of the nave. Severn-side bricks form the chief material used. Outside, the walls are relieved by bands and devices in black and white Staffordshire bricks, and by stone-dressings. Inside, the walls are lined to the height of the window-sills with red bricks, with an arcading in black bricks; above the sills the walls are lined with white Staffordshire bricks, relieved by bands and ornamentations in red and black bricks, pointed with white cement. The roof timbers are all stained and varnished, and the spaces between the rafters are plastered. Hereafter the panels of the chancel will probably be decorated with colour. The fittings throughout are of deal, stained and varnished. The system of warming is that by Porrett's underground stove. The roof is covered with red and blue Broseley tiles, arranged in ornamental patterns. At the west end a bell-cot has been erected of brick and stone, surmounted by a stone cross; at the east end, over the chancel, there is an iron finial, painted in chocolate, relieved with gilding. The porch is at the north-west corner of the nave, and is surmounted with a light iron finial. The whole of the floor of the nave is laid with tiles, blue, red, and white, arranged in patterns. The floor of the chancel has been laid with tiles by Godwin, of Lugwardine. The chancel-arch is of red and white stone, and rests on corbels, on which are carved angels. The corbels in the chancel are carved with the cross and crown, and the emblems of our Lord's passion. There is a credence on the north side of the altar. The five windows of the chancel are filled with stained glass by Messrs. Clayton & Bell. The subjects are,—Our Lord as the Good Shepherd in the centre, and the four Evangelists, two on either side. Beneath the figures, which are all in standing attitudes, are placed in quatrefoils the emblems of our Lord and the Evangelists,—the Agnus Dei, the Angel, the Lion, the Ox, and the Eagle. An organ of six stops has been placed in the church. It was built by Messrs. Bryceson, Brothers, of London, and was shown at the Paris Exhibition last year. The whole of the iron-work and gas-fittings were made by Mr. Cormell, of Cheltenham; the seats and roof have been stained by Mr. Barnes, of Gloucester; and the church has been erected, under the personal superintendence of Mr. Henry Medland, by Messrs. King & Godwin, of this city. The outlay has exceeded 2,000*l*.

Rushall.—The church here has been re-opened after alterations and repairs. In the alterations the style has been adhered to, but by an addition of a spire a new appearance has been given to the building. The nave has been enlarged 33 ft., and so 104 new sittings have been obtained. The whole building has been repaired and renovated, and the work has been done by Mr. Highway, builder, Walsall, from designs by Mr. Cranston, architect, Birmingham. The cost of the whole is about 2,000*l*., which has been defrayed by Mr. W. Mellish, Q.C., one of the patrons of the church.

DISSENTING CHURCH-BUILDING NEWS.

Liverpool. — The new Welsh Presbyterian Chapel in Prince's-road has been opened for divine service. We are indebted to the local *Journal*, which gives a description of the edifice, accompanied with an engraving, for the following particulars. The chapel, with its two lecture-rooms, two vestries, keeper's house, &c., occupies an open site at the corner of Upper Hill-street and Prince's-road, the principal façade being towards the latter. The chapel proper is built of stone throughout, yellow sandstone being used for all the finishings and ornamental portions, and grey-tinted Yorkshire shoddies for the general wall surfaces. The style of architecture is Gothic, with a strong bias towards the Early French school in all the details. In plan the chapel is in the form of a T, although not perfectly so, for the nave is continued eastward of the transepts about 5 ft., forming a recess for the reception of the pulpit and its accessories. The ground-floor is seated for about 800 persons, and is free from all obstructions to sight, except two slender marble columns which support the centres of the transept galleries. The two columns supporting the end gallery are so placed as to be out of the line of vision of any sitting behind them. The three galleries are seated for about 300 persons. At the north-east corner of the chapel rises the tower and spire to about the height of 200 ft. This feature is described as being the finest in this district. The lower portion of the tower forms the principal porch. The upper stage of the tower is pierced with eight deeply-recessed and shafted belfry-lights. At this stage the eight great buttresses of the tower terminate against the base of the angle pinnacles in open tabernacles, supported on red columns. Above the parapet, in the base of the spire, are four lofty lucarne lights with pinnacled canopies supported on long detached red columns. The tower is attached to the body of the chapel by a vestibule, in which are placed the stairs to the end gallery of the nave. The main gable to Prince's-road contains a group of three deeply-recessed and traceried windows, the centre one being about 40 ft. high. A projecting porch is placed on the south side of the nave opposite the tower vestibule. The side windows of the nave and transepts are large, and the transept gables are pierced with triplets of lofty traceried windows. The west gable, over the pulpit, has a large rose window of plate tracery. The whole of the windows throughout the chapel are glazed by Messrs. Edmondson & Son, of Manchester. The whole of the woodwork of the interior, with the exception of the pulpit, is of selected pitch pine. The seating is open, and furnished with crimson cushions. The gallery fronts are arcaded with moulded arches, supported on black shafts, and bracketed from the beams. The latter are supported on wall corbels and columns of green marble with carved capitals. The pulpit (not quite finished) is constructed of oak, relieved with rosewood, teak, ebony, and boxwood. The chief feature of the interior is the ceiling. It is plastered between transverse and horizontal wood ribs, and is in shape a pointed cradle roof. The curved transverse ribs are supported on wall columns with carved capitals of various designs. The chapel is lighted by gas-fittings in wrought iron and brass, designed by the architects, and manufactured by Messrs. Charles Smith & Sons, of Birmingham, who also supplied the whole ornamental ironwork and ironmongery about the buildings. The cast railing of the boundary-walls was made by Messrs. Harrison & Son, of Liverpool. To the west of the chapel are large and convenient buildings in ornamental brickwork, containing two lecture-rooms, two vestries, and keeper's house, with other conveniences. The masonry was executed by the late Mr. Stirling and Mr. Edwards, of Liverpool. The woodwork has been executed by Mr. James Pollock. The plastering, &c., was done by Mr. Roberts. The woodwork of the interior was varnished by Mr. A. Lillyman, painter and plumber. The architects from whose designs, and under whose superintendence the whole of the works have been executed, are Messrs. W. & G. Audsley, of Liverpool.

SCHOOL-BUILDING NEWS.

Liverpool.—The chief stone of St. Titus's National Schools, Portland-street, has been laid. It was estimated that about 4,000*l*. would be required, and towards raising this amount the Government and the National Society promised 700*l*., and the Liverpool Church and School Extension Society 1,000*l*. A space of ground was obtained on the right-hand side of Portland-street, and the schools will be erected nearly opposite to the church. The building will be a very plain and substantial one, and executed in grey bricks, with stone dressings. There will be three floors, each having a school-room 56 ft. 6 in. long by 18 ft. wide, with class-rooms 24 ft. long by 15 ft. 6 in. wide. Stone staircases will lead to each floor. There will be a spacious playground attached to the schools, which are estimated to accommodate 500 children. The architects are Messrs. Culshaw & Sumners, and the contractors Messrs. J. Burroughs & Sons.

Surrey.— A contract has been signed with Messrs. Mansfield, Price, & Co., for 15,000*l*., for the county school buildings, to accommodate 300 boys. This contract includes a chapel, which is the gift of Mr. W. H. Peek, of Wimbledon House. The new buildings are to be completed in twelve months.

Stockport.—The foundation-stone of St. Paul's New Schools, Portwood, was to be laid on Wednesday. The schools are to accommodate 500 children. They are to be fitted with separate lavatories for boys and girls, and to be warmed with Haden's heating apparatus. The architect is Mr. Medland Taylor, of Manchester; and Mr. W. H. Brown is the contractor.

Wakefield. — The foundation-stone of new National and Sunday Schools to be built in Zetland-street, in connexion with the Wakefield Parish Church, has been laid. The buildings, which are of Gothic design, and are intended to afford accommodation for 500 children, consist of boys' school-room, 60 ft. by 20 ft.; girls' room, 66 ft. by 20 ft.; infants'room, 52 ft. by 21 ft.; and two class-rooms, each 16 ft. by 16 ft. Cloak-rooms and lavatories will also be fitted up adjoining the entrances. The boys' and girls' rooms are so arranged that they can be thrown into one. The external faces of the walls will be of pitched-faced stone from quarries in the neighbourhood, with tooled dressings. Internally the rooms will be plastered, also ceiled at the rafters, and the roofs being high-pitched and open-timbered, wrought, stained, and varnished. The whole of the inside wood-work will be stained and varnished. The roofs will be covered with blue and purple slates in bands, surmounted by red ridge tiles. The contracts for the various works have been let to Mr. Geo. Fawcett (brick and stone), Mr. J. P. Hill (slating), Mr. C. Driver (plastering), Mr. J. B. Goldthorp (carpenters' and joiners' work), Mr. Drake (plumbing and glazing work), Mr. Thomas Hudson (ironwork), and Messrs. Hodgson & Son (painting and staining). The cost of the buildings will be about 1,800*l*., and they will be carried out from the designs and under the superintendence of Mr. William Watson, of this town, architect.

Miscellanea.

HOMES OF THE PEOPLE IN EDINBURGH. — Sir J. Y. Simpson states that in the old town of Edinburgh there are 13,000 families, consisting of 60,000 individuals, living in one-roomed houses; and that 1,500 rooms are the abodes, day and night, of from 5 to 15 persons. About 120 have no windows, and 900 of them are cellars.

THE ARCHÆOLOGICAL SOCIETY OF MALTA.—At a recent meeting of this Society, Colonel Collinson, R.E., and Deputy-Adjutant Commissary-General Furse presented a plan of the Phœnician ruins at Hagiar Kim, near Crendi, about six miles distant from Valetta. A lecture was delivered in illustration of the plan by Mr. Furse, which gave the audience some idea not only of the ruins themselves, but of who are to be considered, according to the description of ancient authors, and the generally received tradition, the first inhabitants of these islands and the architects and builders of Hagiar Kim.

SELF-FEEDING PENHOLDERS.—A renewed attempt has been made to form a self-feeding penholder on improved principles. Mr. F. F. Benvenuti, principal of the Swansea Training School and Literary Institute, is the inventor. The *Cambrian* states that he has given the pen a thoroughly practical trial, and readily acknowledges its advantages over others. Ink can be kept in the holder for several days together—always at hand when wanted; whilst in writing, blots, which accompany other self-feeding holders, are almost impossible. Messrs. George Rowney & Co., of London, his agents, adds our authority, recently received a testimonial from Mr. Redgrave, the principal of the Science and Art Department of the South Kensington Museum recommendatory of it as a drawing-pen, and a valuable acquisition to the architect.

VALUE OF ILLUSTRATED BOOKS. — The *Publishers' Circular* mentions an incident at the sale of the library of the late Mr. Windus, of Tottenham, as showing the increasing value of choice books. One of the gems of the collection was a copy, on large paper, of Dr. J. T. Dibdin's "Bibliographical, Antiquarian, and Picturesque Tour in France and Germany," illustrated with etchings, India proof engravings, private plates, original drawings by Lewis, Pugin, and others, extending the three volumes to six. The copy was formed by Mr. Eyton, and at the sale of his library twenty years ago it was purchased for 63*l*. by Mr. Lilly, who disposed of it for 100*l*. The same book was knocked down a few days since for 240*l*. to Mr. Harvey, of St. James's-street, the next bidder being again Mr. Lilly, its former possessor. This sale afforded many other exemplifications of the same fact, which is, indeed, obvious to any one who takes an interest in literature.

ARCHITECTURAL EXHIBITION SOCIETY. — The private view of the Exhibition will take place on Wednesday, the 29th inst. A *Conversazione* will be held on the 5th of May.

THE NEW ST. THOMAS'S HOSPITAL. — Her Majesty has named Wednesday, the 13th of May, at half-past eleven o'clock, for the ceremony of laying the first stone of the new St. Thomas's Hospital.

OPENING OF THE NOTTINGHAM FREE LIBRARY.—The Mayor has opened the Free Library in the presence of a large number of gentlemen. It contains 3,500 vols. of voyages and travels, biography, and history; 5,000 of poetry, novels, and miscellaneous works; 1,200 of the sciences, philosophy, &c.; 600 of theology and ecclesiastical history; and 300 politics, law, economy, &c. A reading-room, a museum, and a reference-library, are also shortly to be added.

MEMORIAL TO SERGEANT BRETT. — A stone tablet, in memory of the victim of the Fenian outrage, has just been erected in St. Barnabas's Church, Manchester. The inscription is as follows:—Erected by the minister and congregation, in memory of Charles Brett, police sergeant, of this city, who for many years worshipped in this church, until he fell at his post of duty, a victim of the violence of sedition, on the 18th September, 1867. A faithful man. Though proffered life, he chose a cruel death rather than betray his trust."

FINSBURY AND ALEXANDRA PARKS.—The enclosing and laying out of the grounds of Finsbury Park, formed on the site of Hornsey Wood House and its extensive grounds, is advancing favourably. The fencing around the extensive and picturesque tract of land for Alexandra Park, situated between Muswell-hill and Woodgreen, Tottenham, is now completed, and the planting of flowering shrubs, bulbous roots, and flowers along the borders of the flower-beds and grass-plots progresses rapidly, many of the earlier descriptions being in bloom. The entrance and carriage-drives through the park are finished. The large trees on the Muswell-hill side are left standing.

TINNING THE INTERIOR OF LEAD PIPES.—A method of tinning the interior of lead pipes has been patented by Mr. Peter Naylor, of New York, U.S. The invention consists in a mode of applying to the interior of the pipe a flux that will protect the lead from oxidation, and insure a perfect coating of tin when the tin is poured through the pipe, or the pipe is dipped into the bath of tin. After the lead pipe has been made, place the same in a vertical or nearly vertical position, and pass down through the same a strong cord, to which a weight is attached to draw the cord through the pipe, and at or near the other end of the cord a sponge, or piece of other porous elastic material is attached, of a size to fill the pipe, and of any desired length,—say 6 in., more or less. The flux employed is either grease or muriate of zinc, but any other flux may be used. The sponge or porous wad, being saturated with this flux, is drawn through the pipe, and by its length insures the covering of the entire surface of the inside of said pipe with the flux, so that the melted tin, subsequently applied, will adhere to all parts with uniformity and firmness.

OPENING OF ANOTHER TUMULUS IN NORTH YORKSHIRE.—The Rev. Canon Greenwell, of Durham, has commenced the examination for scientific purposes of the large tumulus situated on the western scarf of the Yorkshire Wolds, at an altitude of about 750 ft. on the Kirby Underdale estates of Viscount Halifax. A week's digging on the southern side of the barrow has produced an unexampled number of burials, all Anglo-Saxon and secondary interments, so that very little progress has been made towards reaching the primary. With the remains of men have been found bronze and iron swords and knives, and with women buckles, brooches, &c., and various beads. The strange feature has been that the bodies have many of them been interred in the doubled-up way, hitherto thought to pertain only to the ancient Britons; but some were at full length, and when so were east and west. The results so far are enigmatical, presenting the first samples of contracted Anglo-Saxon burials. The full examination will stand over till summer, when several of the leading archæologists will attend. It is believed the Anglo-Saxon burials surround the mound, which will contain the earlier British ones in the centre.

GAS.—The Sheffield Gaslight Company have declared a dividend of 10 per cent. for the last year.——The Colnbrook Gas Company, under new management, have reduced the price of their gas another shilling per 1,000. The price is now 6s.

SOCIETY FOR THE ENCOURAGEMENT OF THE FINE ARTS.—Mr. Hyde Clarke, D.C.L., at the last meeting, gave a lecture on "Ephesus," when the collection of photographs by Mr. Sooboda were exhibited in the rooms of the society. Mr. F. Y. Hurlstone, V.P., and Pres. S.B.A., was in the chair. The lecturer, briefly alluding to the prehistoric period of Ephesus, with its caves and rock pictures, regretted that such a mine of artistic and archæologic wealth had not met with more explorers; and next reverting to the historic period, remarked that within a circle whose radius was 30 miles were concentrated the schools of art of great cities, to which artists then resorted as to the galleries of Europe at the present day. Mr. Falkener, like Professor Donaldson, was only a few days on the spot, and had therefore but little time to examine the monuments, the unhealthiness of the district hindering further investigation. In the discussion that followed, Mr. A. A. Fry said that he hoped the facilities now afforded in travelling would induce the educated classes of England and France to visit the cities of Asia Minor, and explore localities of such surpassing interest.

VOTES TO SCIENCE AND ART DEPARTMENT.—The estimates propose a vote this session of 239,290*l.* for the Science and Art Department, an increase of 29,565*l.* over the vote of last session. The increase is chiefly in the grants in aid to schools of science and art—10,300*l.* in the payments to teachers on results, and 15,750*l.* in the payments to managers under the Minutes of 1865. The number of persons under instruction in science in May, 1867, was 10,230, an increase of no less than 3,388 over the number in May, 1866. The students taught drawing in schools of art and in night classes, day schools for the poor, &c., were 104,668 in 1866. The vote for purchase, circulation, and loan of objects of art shows a large increase. A vote of 10,000*l.* is proposed, in part of 20,000*l.*, for the removal of the iron building at South Kensington to a site offered at Bethnal-green, with a view to the establishment of an auxiliary Museum of Science and Art in the East of London. The vote for the National Portrait Exhibition is 3,000*l.*, and the receipts for admission are estimated at a like sum of 3,000*l.*; the expenditure in 1866 amounted to 3,882*l.* The accounts for 1867 were not closed when the estimates were prepared for this session. The vote for the permanent buildings at South Kensington this year will again be 32,500*l.*, on further account of 195,000*l.*

THE POST-OFFICE AND THE TELEGRAPH.—The report of Mr. Scudamore to Lord Stanley of Alderley, upon the advisability of working the electric telegraphs by the Post-office has just been published. It is prefaced by a letter from the late Postmaster-General, in which he states that for some years he had been in favour of uniting the managements of the telegraphs and the post. In the report itself Mr. Scudamore compares at some length the results of the Belgian and Swiss systems with the English. In 1860, in Belgium, the proportion of telegrams to letters sent was 1 to 218. The Government reduced the price from 15d. to 10d., and immediately the proportion rose to 1 telegram to 114 letters. A further reduction to 5d. has raised the proportion still further. It was in 1865, 1 to 48. In Switzerland, too, a low rate,—1 fr. for 20 words,—prevails. In 1865 the proportion was 1 telegram to 69 letters; while in the United Kingdom the proportion, which in 1863 was 1 to 197, had only risen in 1865 to 1 to 151. Mr. Scudamore then passes on to consider the objection that the subordinate agents of the Post-office department in the small provincial towns are incompetent to control the telegraph. He answers that there is nothing peculiarly disqualifying in a postmaster, and that an increased pay would bring greater efficiency to the work. He thinks that the whole of the companies' properties and rights might be bought for 2,400,000*l.*, and as much as 2,500,000*l.* would be required to start the scheme. If we got the same proportion of telegrams to letters as Belgium, and set the average of product of each telegram to 1s. 2½d., deducting all charges, there would be, Mr. Scudamore shows, a net produce of something over 500,000*l.*

SOUTH KENSINGTON MUSEUM.—During Easter week, free, the visitors numbered 31,800; and there went to the National Portrait Exhibition, by payment, 3,441.

ARCHÆOLOGICAL REMAINS IN THE SOUTH AMERICAN HIGHLANDS.—Some remarkable remains of the aborigines have been discovered in Chili, on the summit of the Cordillera of Dona Ana.

INFECTIOUS DISEASES.—The committee of the University College Hospital have, through the Hospital Carriage Fund, been placed in the possession of a carriage for the convenience of persons suffering from infectious diseases. The committee have determined that persons requiring it, and who reside within a three-mile radius of the hospital, may obtain it upon application to the clerk at the hospital, and paying the actual expenses of hire.

THE LEEDS SEWERAGE.—A report, by the borough surveyor, Mr. A. M. Fowler, to the Streets and Sewerage Committee of the town council, upon forming a drainage district for the south-west portion of the borough of Leeds, and the effectual sewerage of the same, has been printed by authority of the council. The cost of draining the district, including storm outlets and contingencies, is estimated at 40,500*l.* The question how the borough sewerage can best be ventilated is at present referred to a sub-committee.

ROYAL MICROSCOPICAL SOCIETY.—At the annual *soirée* of this society, held at King's College, on Wednesday evening last, the 22nd inst., a large number of the scientific novelties of the day were presented in a very attractive form. Amongst the most remarkable, we may mention a preparation showing the decomposition of water, and two solid pieces of plate-glass, an inch and a half thick, pierced by the electric spark. Under the microscopes were shown sections of the human tongue and brain, and the usual number of living beings from the invisible world. Amongst the works of art were exhibited a large collection of highly-finished drawings of botanical, physiological, and zoological subjects; a number of handsome bronzes, by F. Spurrell; and a collection of flower-vases and *repoussé* salvers in beaten metal, by Richardson, Slade, & Ellson.

"THE WALL OF ANTONINUS."—The *Edinburgh Courant* says, in the course of some improvements on the property of Mr. Cadell, of Grange, the workmen turned up a large stone, which at first was thrown aside as an ordinary boulder, and for a time was allowed to lie on the surface. An examination afterwards made, however, showed that the reverse of the stone contained an inscription which seemed to identify it with the wall of Antoninus (commonly known in that quarter as "Graham's Dyke"), built during the Roman occupation of Lollius Urbicus, for the purpose of shutting off the wild tribes to the north, and which was supposed to extend from the Forth to the Clyde. From the inscription it is conjectured that this stone was intended to commemorate the finishing of the wall; and, if so, it will prove a valuable aid to antiquarian research, as showing how far the work actually did extend eastward. It is to be hoped *this* will not be sold to go to America.

FROSTING IN COLOURS, AND ON PAPER AND COTTON FABRICS. — A curious discovery has recently been made by M. Auguste Bertsch, and turned to practical account by M. Kuhlmann, the celebrated chemist. The beautifully symmetrical and yet fantastic figures of leaves and flowers depicted on the window panes of a room on a frosty morning have been closely imitated, according to *Galignani*, by means of Epsom salts (sulphate of magnesia) dissolved in beer, together with a small quantity of dextrine (artificial gum), and in this state applied to a pane of glass with a sponge or brush. The liquid may receive any colour whatever, at the option of the operator. M. Kuhlmann, on being apprised of the fact, conceived the idea of transferring those fairy-like creations to stuffs and paper. For this purpose he first got the crystallizations on sheets of iron, on which he afterwards laid one of lead. By means of a powerful hydraulic press the minutest details of the figures in question were durably imprinted on the soft metal, and a copy of them in relief was then obtained by galvanoplastics. In impressing cotton stuffs the patterns must be continuous. This obstacle has been overcome by effecting the crystallization on the cylindrical surface of a roller.

AN ENGLISH CHURCH IN DRESDEN.—The foundation-stone of an English church has been laid here, an English lady having generously subscribed the sum of 4,000*l.* towards the execution of the project. The design for the structure is by an English architect. The new building is to bear the name of All Saints' Church.

SALISBURY CATHEDRAL.—The Dean of Salisbury has received a cheque for 500*l.* from the Rev. C. B. Bicknell, rector of Stourton, for the purpose of placing twelve statues in the west front of Salisbury Cathedral, in addition to the forty which have been ordered by the dean and chapter. Fourteen statues have already been placed in niches.

MEMORIAL CHURCH IN CLERKENWELL.—A church is about to be erected in the St. John-street-road, for the new district of St. Peter's, in the parish of St. James, Clerkenwell, upon the site secured as the nearest available to the scene of the Smithfield martyrdoms. The total cost, including schools and parsonage adjoining, is not to exceed 10,000*l.*

THE DRINKING FOUNTAIN IN MARYLEBONE-LANE, OXFORD-STREET.—We regret to learn that this fountain is being allowed to fall into a state of dilapidation. The malicious acts of drunken varlets fresh from beer-shops only show how desirable it is to place drinking-water within reach of thirsty wayfarers, and we hope the authorities will not be disheartened by repeated acts of this description, but that they will set watch for the depredators, and hand them over to the police-courts, where they will meet with their deserts.

GUN-COTTON AND ITS SAFETY.—Mr. James Wilson (of the North-Eastern Goods Manager's office) has reported upon experiments undertaken for the purpose of investigating the risks incurred in the conveyance of compressed gun-cotton charges upon the North-Eastern Railway. The experiments were conducted by Mr. Prentice, of the Gun-cotton Company. The results of the experiments are said to have been convincing, and enabled Mr. Wilson to report that the railway company might safely carry gun-cotton along with other goods in ordinary wagons, adopting the same rules as now apply to the conveyance of cartridges.

THE MANCHESTER NEW STOCK EXCHANGE.—On Tuesday last, the members of the Manchester Stock Exchange assembled for the first time in their new room, in Commercial Buildings, Cross-street. The Exchange-room forms a part of a large structure which has been erected by the Commercial Buildings Company, and is now fast approaching completion. The front will be occupied by shops and offices; and there is a separate entrance in Newmarket-street to the Stock Exchange, which is upon the first floor, and is reached by two flights of steps. The Exchange-room is 66 ft. in length, by 46½ ft. in breadth. There is accommodation for about 120 members; and opposite to the main entrance are a reading-room, and offices for each of the telegraph companies. Messrs. Walters, Barker, & Ellis, of Manchester, are the architects, and the entire contract for the building has been executed by Mr. Wm. Southern.

UTILIZATION OF WASTE.—The refuse ore which formerly used to obstruct the entrance to some German mines has become highly valuable since it was discovered that it contains metals so important as nickel and cobalt. The liquor which the manufacturers of soap formerly allowed to run off as useless is the source from which we derive glycerine. The sulphuric acid which used to poison the atmosphere and to destroy vegetation in the neighbourhood of works for roasting sulphurets, is now carefully saved and converted into sulphuric acid. The "soda waste," which was permitted to accumulate in mountains in factories, is now made to yield quite a number of useful products, such as sulphur, hyposulphite of soda, and others. In many instances still, products, solid, liquid, and gaseous, are wasted, permitted to escape with the atmosphere, to fill the sewers, or to decay out of doors, which would yield a rich reward to the man who would turn them to serve some useful purpose. Nothing ought to be thought too insignificant for consideration. Who knows, says the *Scientific American*, but what even the carbonic gas which we are now glad enough to get rid of by our chimneys may hereafter be conveniently rendered useful in the economy of our households.

BEQUESTS TO BRITISH MUSEUM.—The late Mr. Felix Slade, of Lambeth, has left to the British Museum his collection of glass, consisting of vases and other objects illustrative of the art of glassmaking from the earliest period to the end of the seventeenth century. He has likewise bequeathed to the Museum his extensive collection of engravings; also the sum of 45,000*l.* to be applied to the endowment of fine arts professorships at Oxford and Cambridge, and at University College, London, where some exhibitions also are to be founded. The fine collection of Venetian glass belonging to Mr. E. W. Cooke, R.A., is about to be sent to the South Kensington Museum on loan for a year.

REFORM OF THE PATENT LAWS.—On Thursday last the Hon. Aubernon Herbert, B.C.L., presided at a Second Conference on the Reform of the Patent Laws, at the Inventors' Institute. The secretary of the Institute, Mr. R. Marden Latham, read the report of the proceedings of the committee nominated a month ago, and composed of members of the council, together with representatives of various public bodies. From this document it appeared that arrangements are in progress for an effective agitation in the interest of inventors, and that already Mr. A. H. Layard, D.C.L., M.P., has consented to preside at a public meeting to be shortly held in London. The chairman moved the adoption of the report; and in doing so expressed his thorough appreciation of the important steps which were being taken. A petition was then submitted, and having been unanimously approved of, was ordered to be signed by the chairman in the name of the meeting.

THE EDUCATION GRANT.—The vote proposed for public education in Great Britain for the year ending with March, 1869, is 842,554*l.*, an increase of 136,689*l.* over the vote for the fiscal year just expired. The calculation based upon the number of scholars in average attendance in schools inspected in the last school year in England, with the per-centage added for the ordinary increase, gives 985,200 as the estimated average attendance in 1868; but an addition of 45,000 is made for half-timers under the Workshops Act, and of 16,000 for scholars in Congregational and other schools newly admitted to aid, raising the estimated number of day scholars to 1,046,200. Briefly, the vote for Great Britain to be proposed this session stands thus:—Office in London, 29,482*l.*; inspection, 64,103*l.*; normal schools, 74,250*l.*; building grants, 45,000*l.*; annual grants, England and Wales, 549,689*l.*; grants to teachers in Scotland, 79,500*l.*; unexpired pensions, 580*l.* Total, 842,554*l.*

ARCHÆOLOGICAL DISCOVERY AT BEEWICK.—While trenching ground for a garden at a recently-erected villa, in the Inner Cow-close, on the corporation property, the gardener, being compelled to go deep, came upon the skeletons of several human beings in different parts of the ground. On each side of three of the bodies were slabs of undressed stone, with rude stone coverings. On one was an incised cross, with a rose in the centre; and on another, the cist of a child, was a Latin cross. The place was probably at one time a burial-ground, but at what time it is impossible to say. At another part of the ground there was discovered a tower-like structure, in front of which is a wall 4 ft. thick, and running in a transverse direction into a portion of the adjoining land. Permission was obtained to trace the wall into the adjoining land, and it has been ascertained that the wall is 94 ft. long, by 43 ft. in width; the solid masonry is 23 ft. square, and between the wall and the building is a space of 20 ft. From a small piece of architectural moulding which was found, it is presumed that the building belonged to the Norman period.

TENDERS.

For alterations and additions to Thorpe Rectory, near Norwich, exclusive of old materials. Mr R. M. Phipson, architect:—

Hood	£2,326 0 0
Brookes	2,310 0 0
Lacey	2,299 0 0
Balls	2,270 0 0
Downing	2,219 0 0
Newell (accepted)	1,954 0 0

For restoring Stoke Ash Church, Suffolk, exclusive of old materials. Mr. R. M. Phipson, architect:—

Burrell	£687 15 0
Rednall & Vine	594 12 6
Bishop	575 0 0
Cornish (accepted)	568 0 0

For new shop-front, &c., at No. 5, Exmouth-street, Clerkenwell. Mr. Wm. Smith, architect:—

Dove, Bros. (accepted)	£426 0 0

For alterations, Messrs. Coates & Co's., Whitechapel. Mr. James Harrison architect. Quantities supplied by Messrs. Leaning & Nicoll and Mr. C. A. Gould:—

Browne & Robinson	£819 0 0
Webb & Sons	815 0 0
Ashby & Sons	810 0 0
Ashby & Horner	798 0 0
Hill & Keddell	787 0 0
Little (accepted)	783 0 0

For Hemel Hempstead Church. Messrs. Drury & Lovejoy, architects. Quantities supplied by Messrs. Curtis & Son and Rake & Ranwell:

	A seats.	B seats.
Cook	£3,752 0 0	£3,706 0 0
Humphrey	3,325 0 0	3,325 0 0
Chappel	3,176 13 0	3,289 3 0
Sear	3,170 0 0	3,240 0 0
Nightingale	3,138 0 0	3,178 0 0
Harris	3,025 0 0	3,050 0 0
Webb	2,925 0 0	2,985 0 0
Wilkins	2,902 0 0	2,882 0 0
Gibson (accepted)	2,800 0 0	2,864 0 0

For a chapel at the Grissenhall Union, Norfolk, exclusive of stone. Mr. R. M. Phipson, architect:—

Harrold	£637 10 0
Skipper	564 0 0
Perkins	530 0 0
Jackson	527 0 0
Larner (accepted)	478 0 0
Nelson	425 0 0

For St. Paul's District Schools, Stratford, Essex. Mr. Ough, architect. Quantities supplied:—

Hedges	£2,834 0 0
Wood	2,831 0 0
Morter	2,817 0 0
Mansfield	2,810 0 0
Chalton	2,626 0 0
Rivett	2,493 0 0

For chapel, Victoria Docks, for Mr. Duncan. Mr. Marshall, architect. Quantities supplied:—

Choffins	£1,856 0 0
Norton	1,820 0 0
Manley & Rogers	1,807 0 0
Hughes	1,788 0 0
Shermur	1,648 0 0
Cuthbert, Bros.	1,616 0 0
Rivett	1,537 0 0
Perry & Co.	1,515 0 0
Morter	1,497 0 0
Ennor	1,490 0 0
Clubb & Co. (accepted)	1,350 0 0

For alterations at the Church of St. Francis Xavier, Liverpool. Messrs. Picton, Chambers, & Bradley, architects. Quantities supplied:—

Haigh & Co.	£5,350 0 0
Westmorland	4,898 0 0
Mullen	4,799 0 0
Urmson	4,654 0 0
Jones & Son	4,649 0 0
Hughes	4,590 0 0
Callie	4,510 0 0
Rowe (accepted)	4,444 0 0

For house and offices, Sutton Oak, near St. Helen's, for Messrs. Jno. Marsh & Co. Messrs. Picton, Chambers, & Bradley, architects. Quantities supplied:—

Leatham	£820 0 0
Harrison	816 18 0
Harris (accepted)	797 10 0

For alterations, &c., at 21, Aldersgate-street. Mr. D. Campbell, architect:—

Myles	£1,057 0 0
King & Sons	763 0 0
Anderson	740 0 0
Carter	737 0 0
Sewell	730 0 0

For rebuilding warehouse, No. 22, Crutched Friars, for Messrs. Hy. Bucknell & Sons. Mr. Arthur E. Taylor, architect. Quantities supplied by Mr. Joseph Clever:—

Thompson	£3,223 0 0
Higgs	3,114 0 0
Rider & Son	2,883 0 0
Kilby	2,769 0 0
Browne & Robinson	2,730 0 0
Ennor	2,708 0 0
Conder	2,580 0 0
Henshawe	2,575 0 0
Morter (accepted)	2,543 0 0

For the erection of a village residence at Grays, Essex, for Messrs. Sturgeon & Sons. Mr. D. A. Cobbett, architect. Quantities supplied by Mr. Geo. Mortimer:—

Harris	£2,620 0 0
Rivett	2,530 0 0
Crabb & Vaughan	2,455 0 0
Hall	2,347 0 0
Forrest	2,269 0 0
Blake (accepted)	2,265 0 0

For the erection of a villa residence near Severndroog Castle, Shooters' Hill. Mr. C. E. Barlow, architect. Quantities supplied by Mr. Geo. Mortimer.

Newman & Man (accepted)	£5,228 0 0

For new workhouse for St. Mary's, Islington, to be erected in St. John's-road, Upper Holloway. Mr. R. H. Bendon, architect:—

Nutt & Co. (accepted)	£64,200 0 0

For Nottingham County Court. Mr. Thos. C. Sorby, architect. Quantities supplied by Mr. J. Scott:—

Hall	£6,280 0 0
Barke	6,250 0 0
Huddlestone	6,188 0 0
Simpson & Co.	6,078 0 0
Marriott & Co.	5,980 0 0
Dennett	5,879 0 0
Bell & Co.	5,839 10 0
Stephenson & Co.	5,698 0 0
Johnson	5,650 0 0

For the erection of a Congregational church at Moretonhampstead, Devon. Mr. John Tarring, architect :—

Bragg	£1,325	0	0
Bragg & Dyer	1,128	6	9
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AN experienced DRAUGHTSMAN desires a RE-ENGAGEMENT in town. Qualifications:—Design (Gothic), colouring, perspective, detail, and construction. Eleven years in the profession. Two years out-door experience. References to eminent Architects. Aged 26. Terms moderate.—Address, BARDSLEY, 9, Cardington-street, Hampstead-road, N.W.

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